



National Aeronautics and  
Space Administration

# Budget Estimates

FISCAL YEAR **1986**

Volume III

Research and Program Management

Special Analyses

CONTENTS

RPM i

RESEARCH AND  
PROGRAM  
MANAGEMENT

-

SUMMARY  
INFORMATION

INSTALLATION  
JUSTIFICATION

## **RESEARCH AND PROGRAM MANAGEMENT**

### **FISCAL YEAR 1986 ESTIMATES**

#### **GENERAL STATEMENT**

The Research and Program Management appropriation funds the performance and management of research, technology and test activities at NASA installations, and the planning, management and support of the many and varied contractor research and development tasks necessary to meet the Nation's ongoing objectives in aeronautical and space research. Objectives of the efforts funded by the Research and Program Management appropriation are to (1) provide the technical and management capability of the civil service staff needed to conduct the full range of programs for which NASA is responsible, (2) provide base maintenance of facilities and manage their use in support of research and development programs, and (3) provide effective and efficient technical and administrative support for the research and development programs. For 1986, an appropriation of \$1,345,000,000 is requested.

The 21,800 permanent and temporary civil service personnel at eight major installations and Headquarters are funded by the Research and Program Management appropriation. This civil service workforce is NASA's most important resource and is vital to future space and aeronautics research activities. Seventy percent of the Research and Program Management appropriation is needed to provide for salaries and related costs of this civil service workforce. About two percent is for travel, critical to manage successfully the Agency's in-house and contracted programs. The remaining amount of the Research and Program Management appropriation provides for the research, test and operational facility support, and for related goods and services necessary to operate the NASA installations and to accomplish NASA's approved missions efficiently and effectively.

NASA field centers report to the Program Associate Administrator responsible for the major portion of their technical programs. The principal roles assigned each installation based on demonstrated capabilities and capacities to meet NASA's overall program goals are as follows:

#### Office of Space Flight:

Johnson Space Center: Manage the integrated Space Shuttle program, including orbiter production and operation; astronaut and mission specialist selection and training; STS Operations including mission planning, operational procedures and flight control; and management of the integrated Space Station program and definition/development of Space Station hardware.

Kennedy Space Center: Launch of Space Shuttle flights; the ground operational phase of the Space Transportation System; the preparation and launch of payloads on the Space Shuttle and expendable launch vehicles, and Space Station operational readiness planning.

Marshall Space Flight Center: Manage the Space Shuttle main engine, solid rocket booster and external tank projects; management of NASA's activities on the Spacelab project; management of large automated spacecraft projects such as the Hubble Space Telescope; experiments in materials processing in space; and definition/development of the Space Station common module and laboratory outfitting.

National Space Technology Laboratories: Support Space Shuttle engine procurement and testing; Earth resources research and technology transfer; and support functions for other Government agencies located there.

#### Office of Space Science and Applications

Goddard Space Flight Center: Develop and operate the Earth orbital flight experiments and automated spacecraft to conduct scientific investigations and demonstrate practical applications; the management of the tracking and data acquisition activities for Earth orbital missions; management of the Delta launch vehicle program; management and launch of sounding rockets and balloons; operation of an instrumented flight range for aeronautical and space research; and definition/development of the Space Station platforms and payload accommodations. The Wallops Flight Facility is an operational element and component installation of the Goddard Space Flight Center.

#### Office of Aeronautics and Space Technology:

Ames Research Center: Conduct short haul aircraft and rotorcraft research and technology, computational fluid dynamics, planetary probe research, life sciences, aeronautical flight research and testing, as well as providing an alternate landing site for Space Shuttle operational missions at the Dryden Flight Research Facility, an operational element and component installation of Ames.

Langley Research Center: Conduct long haul aircraft research and technology, emphasizing fuel conservation, safety and environmental effects; aerospace structures technology; environmental quality monitoring by remote sensing; and advanced space systems technology.



Lewis Research Center: Conduct aeronautical and space propulsion research and technology; space communications research and technology; space energy systems research and technology; definition/development of the Space Station power system; and development of the Centaur cryogenic upper stage for use in the Space Shuttle and management of the Centaur expendable launch vehicle program.

The 1986 budget provides the necessary resources to apply these in-house capabilities to program activities. Detailed data on funding requirements are provided in the section on each installation. A summary description of, and the funding required by functional category, include:

1. Personnel and Related Costs (\$931,813,000): Includes salaries and benefits, the government's contribution to medicare for NASA permanent and temporary civil service employees, and for personnel of other Government agencies detailed to NASA. This category also supports personnel costs, such as moving expenses (excluding the associated travel of people), recruiting and personnel investigation services provided by the Office of Personnel Management, and the training of NASA civil service employees. The FY 1986 estimate includes the savings related to the five percent Governmentwide reduction in civil service salaries and benefits scheduled to begin in FY 1986 and the reduction of 200 civil service workyears related to the President's Management Improvements Initiative which reduces FTE's related to support activities.

2. Travel (\$31,000,000): Includes the cost of transportation, per diem, and related travel expenses of civil service employees who travel for the direction, coordination and management of all NASA program activities including overseas launch and tracking sites; for contract management; for flight mission support; for meetings and technical seminars and symposia; and for permanent and temporary relocations. Payments to interagency motor pools are included under Operation of Installation (Management and Operations).

3. Operation of Installation (\$382,187,000): Provides a broad range of services, supplies, and equipment in support of each center's institutional activities. These are divided into three major subfunctional areas: Facilities Services, covering the cost of rental of real property, maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; Technical Services, covering the cost of automatic data processing for management activities, and the cost of educational and informational programs and technical shops supporting institutional activities; and Management and Operations, covering the cost of administrative communications, printing, transportation, medical, supply, and related services. The amounts by major subcategory are as follows:

A. Facilities Services (\$212,272,000): Includes rental of real property; the cost of maintenance, repair and related activities for facilities and equipment; custodial services; minor modifications and alterations; and utilities services.

- B. Technical Services (\$66,071,000): Includes the cost of general purpose automatic data processing for management activities; education and informational programs; shops and other essential technical services.
- C. Management and Operations (\$103,844,000): Includes the cost of administrative communications; printing and reproduction; administrative supplies; general purpose materials and equipment; transportation of equipment and supplies (including payments to interagency motor pools); medical services and other support. The 1986 amount includes the effect of the President's Management Improvement Initiative which reduces further administrative costs.

**SUMMARY OF THE BUDGET PLAN BY FUNCTION**

	<u>1984</u> <u>Actual</u>	<u>1985</u> Budget <u>Estimate</u> (Thousands of Dollars)	Current <u>Estimate</u>	<u>1986</u> Budget <u>Estimate</u>
I. Personnel and Related Costs.....	912,249	935,928	956,303	931,813
11. Travel.....	25,644	28,000	30,000	31,000
III. Operation of Installation.....	318,015	367,072	349,997	382,187
A. Facilities Services.....	(163,597)	(198,679)	(184,703)	(212,272)
B. Technical Services.....	(57,339)	(57,765)	(55,513)	(66,071)
C. Management and Operations ....	<u>(97,079)</u>	<u>(110,628)</u>	<u>(109,781)</u>	<u>(103,844)</u>
Total.....	<u>1,255,908</u>	<u>1,331,000</u>	<u>1,336,300</u>	<u>1,345,000</u>

**SUMMARY OF CHANGES FROM THE 1985 BUDGET ESTIMATE TO THE 1985 CURRENT ESTIMATE**

Of the 1985 Research and Program Management request of \$1,331,000,000, \$1,317,000,000 has been appropriated. Supplemental appropriations of \$23,300,000 are being requested to cover partially the \$31,000,000 cost of civil service pay and benefits raises and cost increases in 1985. A recision of \$4.0 million is pending as NASA's reduction related to Section 2901 of the 1984 Deficit Reduction Act. If the requested supplemental is appropriated and the recission approved, the 1985 plan for R&PM will be \$1,336,300,000. The changes from the original request are summarized as follows:

(Thousands of Dollars)

1985 Budget Estimate.....	\$1,331,000
Congressional Action.....	-14,000
Appropriated.....	\$1,317,000
Proposed Recission related to the Deficit Reduction Act of 1984.....	-4,000
Supplemental Request.....	23,300
(Gross cost of 1985 pay increases).....	(\$31,000)
(Absorbed through savings, deferrals, etc. in Personnel and Related costs and other functions.....)	(-7,700)
1985 Current Estimate.....	<u>\$1,336,300</u>

The \$25.7 million reduction from the FY 1985 request (the appropriation reduction from the request: \$-14.0 million; the effect of the Deficit Reduction Act: \$-4.0 million; and the partial absorption of the increased civil service pay costs: \$-7.7 million) will be accommodated largely through deferring and delaying expenditures in all areas of R&PM. In Personnel and Related Costs savings will be achieved through alteration in the timing of career development adjustments, the mix of temporary effort and in the way overtime and holiday premiums are used. In Operation of Installation, cost reductions will be achieved by the delay and deferral of the purchases of supplies, materials, equipment and contractual effort. These reductions place a burden on NASA in providing adequate institutional support to the research and development programs, but the actions planned are designed to mitigate adverse impact as much as possible.

### BASIS OF THE 1986 ESTIMATE

The 1986 budget estimate of \$1,345,000,000, an increase of \$8.7 million over the current 1985 estimate provides for: the personnel and related costs of 21,800 full-time equivalent (FTE) civil service workyears; a minimum level of travel to support Agency missions and programs; support service contractor effort at the anticipated wage-rates; utility usage consistent with programmatic requirements at projected rates; and supplies, materials, equipment and other minor contracts and services at anticipated price levels. In the 1986 Research and Program Management Budget, there are two significant changes from 1985; first, the salary rate for civil service personnel is 5 percent lower in 1986 than 1985. This reduction in salary rates is part of the Governmentwide reduction directed by the President to begin in October 1985. The other major change has been a reduction of 200 civil service FTE's and \$21.0 million related to the President's drive to reduce further administrative costs in the Government. Even though the manpower and other administrative changes will be difficult to achieve, NASA will endeavor to accomplish the reductions in a manner that will have limited impact on program accomplishment. The balance of the changes in R&PM reflect a constant level of operations at expected price levels.

The Research and Program Management appropriation request for 1986, by functional category is summarized as follows:

1. Personnel and Related Costs (\$931,813,000): The 1986 estimate for Personnel and Related Costs is \$24.5 million lower than 1985 and is based on 21,800 FTE workyears, a reduction of 200 from 1985. This reduction, all in indirect civil service, is related to the President's Management Improvement Initiative to reduce further administrative costs in the Government. In addition to the reduction of 200 FTE a further reduction of \$42 million is the result of the effect of the proposed five percent reduction in civil service salaries. Both of these reductions are partially offset by the following: the full-year costs of the 1985 pay and benefits increase (which is in effect for only three-fourth of a year in 1985); the alteration in the mix between reimbursed and direct costs of civil service; the normal costs associated with within-grades, career development, merit pay, etc; and the reversion to the previous method of calculating salaries paid.

2. Travel (\$31,000,000): Because the vast majority of NASA funds are spent out of house, travel for both Programmatic and management purposes is integral to the effective and economical accomplishment of program objectives. In addition, because NASA's civil service workforce is so heavily technical (over 50 percent of NASA's permanent personnel are degreed scientists and engineers) travel to scientific and technical meetings, seminars and symposia is important for the interchange of information. In 1986, the \$1,000,000 increase in travel over 1985 is the increase associated with the expected costs of travel which are partially offset by a reduction in Management and Operations travel related to the President's drive to reduce further administrative costs in Government.

3. Operation of Installation (\$382,187,000): The 1986 plan provides for anticipated changes in the price levels of support service contractor wage rates and utility rates, the alteration in the funding plans from reimbursable launch vehicles activities, and in the price levels for supplies, materials, equipment and minor contracts partially offset by a reduction in the Management and Operations subcategory related to the President's drive to reduce further administrative costs. The amounts by subcategory are as follows:

- A. Facilities Services (\$212,272,000): The 1986 estimate, an increase of \$27,569,000 over the 1985 current estimate, covers the fullyear effect of minor alterations in facilities services begun in 1985, and anticipated rate and price increases for utilities, support contractor wage rates, supplies, materials, equipment and minor contractual effort.
- B. Technical Services (\$66,071,000): The \$10,558,000 increase in 1986 covers anticipated support service contractor wage-rates and the costs of supplies, materials, equipment and minor contractual effort and the continuation of improvements to automated information systems.
- C. Management and Operations (\$103,844,000): The \$5,937,000 decrease in this subcategory is the result of the reduction in administrative costs, partially offset by the increased costs of supplies, materials, equipment and minor contractual effort, the anticipated change in support service contractor wage-rates.

In summary, the 1986 budget requirement of \$1,345,000,000 is to provide for 21,800 full-time equivalent civil service workyears and to support the activities at eight NASA installations and Headquarters, consistent with the research and development and construction of facilities program plans.

## DETAIL OF CONTENTS BY FUNCTION

### **I. PERSONNEL AND RELATED COSTS**

#### **A. COMPENSATION AND BENEFITS:**

##### **1. Compensation:**

- a. Permanent Positions: This part of Personnel and Related Costs covers the salaries of the full-time permanent civil service workforce and is the largest part of this functional category.
- b. Other Than Full-Time Permanent Positions: This category includes the salaries of NASA's non-permanent workforce. Programs such as students participating in cooperative training, summer employment, youth opportunity, and temporary clerical support are covered in this category.
- c. Reimbursable Detailees: In accordance with existing agreements, NASA reimburses the parent Federal organization for the salaries and related costs of persons detailed to NASA.
- d. Overtime and Other Compensation: Overtime, holiday, post and night differential, and hazardous duty pay are included in this category. Also included are incentive awards for outstanding achievement and superior performance awards.

- 2. Benefits: In addition to compensation, NASA makes the employer's contribution to personnel benefits as authorized and required by law. These benefits include contributions to the Civil Service Retirement Fund, employees' life and health insurance, payments to the Medicare fund for permanent employees, and social security contributions for non-permanent personnel. Payments to the civil service retirement fund for re-employed annuitants and for severance pay to former employees involuntarily separated through no fault of their own are also included.

#### **B. SUPPORTING COSTS:**

- 1. Transfer of Personnel: Relocation costs, such as the expenses of selling and buying a home, and the movement and storage of household goods are provided under this category.
- 2. Office of Personnel Management Services: The Office of Personnel Management is reimbursed for certain activities such as security investigations on new hires, recruitment advertising, and career-maturity surveys.
- 3. Personnel Training: Training is provided within the framework of the Government Employees Training Act of 1958. Part of the training costs consists of courses offered by other Government agencies, and the remainder provides for training through nongovernment sources.

## 11. TRAVEL

### A. Program Travel:

The largest part of travel is for direction, coordination and management of program activities including international programs and activities. The complexity of the programs and the geographical distribution of NASA installations and contractors necessitate the need for this category of travel. As projects reach the flight stage, support is required for prelaunch activities, including overseas travel to launch and tracking Sites. The amount of travel required for flight projects is significant as it is directly related to the number of systems and subsystems, the number of design reviews, and the number and complexity of the launches and associated ground operations.

### B. Scientific and Technical Development Travel:

Travel to scientific and technical meetings and seminars permits employees engaged in research and development to participate at both Government sponsored and nongovernment sponsored seminars. This participation allows personnel to benefit from exposure to technological advances which arise outside NASA, as well as allowing personnel to present both accomplishments and problems to their associates and provides for the dissemination of technical results to the U.S. community. Many of the Government sponsored meetings are working panels convened to solve certain problems for the benefit of the Government.

### C. Management and Operations Travel:

Management and operations travel provides for the direction and coordination of general management matters and travel by officials to review the status of programs. It includes travel by functional managers in such areas as personnel, financial management and procurement. This category also includes the cost of travel in and around the Installations; travel of unpaid members of research advisory committees; and initial duty station, permanent change of assignment, and other family travel expenses. Payments to interagency motor pools are included in the Operation of Installation function (Management and Operations subfunction).

## III. OPERATION OF INSTALLATION

Operation of Installation provides a broad range of services, supplies, and equipment in support of the centers' institutional activities. These are divided into three major subfunctional areas: Facilities Services (the cost of renting real property, maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities); Technical Services (the cost of automatic data processing for management activities, and the cost of educational and information programs and technical shops supporting institutional activities); and Management and Operations (the cost of administrative communications, printing, transportation, medical, supply, and related services). A description of each major subfunction follows:



A. Facilities Services:

1. Rental of Real Property: Rental of real property includes the rental of building space directly by NASA or through the General Services Administration to meet offsite office, warehousing, and other requirements which cannot otherwise be provided in existing buildings at the NASA Installation. Most of the funding is required for rental of the NASA Headquarters complex of buildings in the District of Columbia, and nearby Maryland and Virginia that are either Government-owned or leased for which NASA must provide rental payments to the General Services Administration in accordance with P.L. 92-313. Also included in this item is rental of trailers required to accommodate special short-term needs.
2. Maintenance and Related Activities: Maintenance and related activities include the recurring day-to-day maintenance of facilities (ground, buildings, structures, etc.) and equipment which is accomplished by non-Civil Service personnel. This involves the mowing and care of grassy areas, care of trees and shrubs, elevators, cranes, pressure vessel inspections, painting and protective coatings, general buildings maintenance, and the maintenance of installed mechanical, electrical, and other systems. In addition, this item includes feasibility studies, project design, construction supervision, inspection, and other institutional facility engineering functions. Included also are any applicable costs associated with recurring facility work as well as materials, hardware, and equipment used in facility maintenance activities, whether accomplished by civil service personnel or contractors. In the cost of equipment, related maintenance and other services are reflected for office, shop, laboratory and other facilities equipment as well as administrative internal communications and television monitoring equipment.
3. Custodial Services: Custodial services include janitorial and building cleaning services, pest control, fire protection services, security services including badging and identification, lock and safe repair, trash and refuse handling, window blinds and light fixture cleaning, and laundry and dry cleaning of facility related items.
4. Utilities Services: Utilities services include the purchase of utilities such as electricity, natural gas, fuel oil, coal, steam, propane, and other fuel commodities as well as water and sewage treatment services. Also included are the related maintenance and operating costs of the utility plants and systems.

B. Technical Services:

1. Automatic Data Processing:

- a. Equipment: This category provides for the lease, purchase and maintenance of general purpose data processing equipment which supports institutional operations at each installation. Excluded is

equipment dedicated to specific research or operational systems which is funded from the Research and Development appropriation.

- b. Operations: Operations services include programming, computer operations and related services for institutional applications including payroll, financial management, security, maintenance, personnel, logistics, and procurement records and reports.

2. Scientific and Technical Information and Educational Programs:

- a. Libraries: The technical libraries are established to provide installation staffs with books, periodicals, technical reports and other scientific documentation.
- b. Education and Information Programs: The educational and informational programs provide for the documentation and dissemination of information about the Agency's programs to the general public, the educational community at the elementary and secondary levels, and the mass communications media. Assistance to the mass communications media includes the assembly and exposition of newsworthy material in support of requests in the form of press kits, news releases, television and radio information tapes and clips, and feature material.
- c. Shop and Support Services: Shop and support services include general fabrication shops, reliability and quality assurance activities, safety, photographic services, graphics, and audio-visual material.

C. Management and Operations:

- 1. Administrative Communications: Included in this category are costs of leased lines not dedicated to a specific program or project, long distance tolls (including FTS charges), teletype services, and local telephone service.
- 2. Printing and Reproduction: Included in this category are the costs for duplicating, blueprinting, microfilming, and other photographic reproductions. **Also** included in this category are Government Printing Office printing costs, contractual printing and the related composition and binding operations.
- 3. Transportation: Transportation services include the operation and maintenance of all general purpose motor vehicles used by both civil service and support contractor personnel. The cost of movement of supplies and equipment by commercial carriers and payments to interagency motor pools are also in this category.

4. Installation Common Services: Installation common services include support activities at each installation such as: occupational medicine and environmental health; mail service; supply management; patent services; administrative equipment; office supplies and materials; and postage.

**DISTRIBUTION OF PERMANENT CIVIL SERVICE WORKYEARS BY INSTALLATION**

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
Johnson Space Center .....	3. 196	3. 209	3. 222	3. 201
Kennedy Space Center .....	2. 074	2. 082	2. 075	2. 054
Marshall Space Flight Center .....	3. 270	3. 250	3. 251	3. 229
National Space Technology Laboratories.....	107	107	109	106
Goddard Space Flight Center .....	3. 608	3. 599	3. 599	3. 569
Ames Research Center .....	2. 023	2. 021	2. 021	2. 001
Langley Research Center .....	2. 869	2. 835	2. 860	2. 808
Lewis Research Center .....	2. 634	2. 591	2. 604	2. 582
Headquarters.....	1. 327	1. 325	1. 326	1. 292
Inspector General.....	<u>90</u>	<u>98</u>	<u>97</u>	<u>97</u>
Subtotal. Full-Time Permanent Civil Service....	21. 198	21. 117	21. 164	20. 939
Other than full-time permanent workyears .....	<u>882</u>	<u>883</u>	<u>836</u>	<u>861</u>
Total. Ceiling Controlled Civil Service.....	<u>22. 080</u>	<u>22. 000</u>	<u>22. 000</u>	<u>21,800</u>

**SUMMARY OF BUDGET PLAN BY INSTALLATION**

(Thousands of Dollars)

Johnson Space Center .....	200. 963	214. 105	211. 978	213. 713
Kennedy Space Center .....	172. 632	180. 849	181. 980	189. 331
Marshall Space Flight Center .....	189. 852	195. 264	197. 576	195. 805
National Space Technology Laboratories.....	10. 194	10. 905	10. 940	11. 131
Goddard Space Flight Center .....	186. 773	199. 290	199. 482	199. 719
Ames Research Center .....	113. 887	123. 116	121. 527	123. 908
Langley Research Center .....	139. 953	148. 037	148. 731	149. 059
Lewis Research Center .....	128. 704	140. 503	139. 258	139. 896
Headquarters.....	108. 216	113. 613	118. 950	116. 835
Inspector General.....	<u>4,734</u>	<u>5,318</u>	<u>5,878</u>	<u>5,603</u>
Total.....	<u>1,255. 908</u>	<u>1,331,000</u>	<u>1,336,300</u>	<u>1,345,000</u>

**DISTRIBUTION OF PERMANENT CIVIL SERVICE WORKYEARS BY PROGRAM**

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>RESEARCH AND DEVELOPMENT.....</u>	<u>11,310</u>	<u>11,988</u>	<u>11,967</u>	<u>12,470</u>
<u>Space Station.....</u>	<u>430</u>	<u>600</u>	<u>1,324</u>	<u>1,830</u>
<u>Space Transportation Capability Development.....</u>	<u>1,241</u>		<u>1,324</u>	<u>1,367</u>
<u>Space Science and Applications.....</u>	<u>4,478</u>	<u>4,287</u>	<u>4,204</u>	<u>4,219</u>
Physics and astronomy.....	2,386	2,284	2,352	2,358
Life sciences.....	295	271	254	245
Planetary exploration.....	183	171	179	179
Space applications.....	1,614	1,561	1,419	1,437
<u>Commercial Programs.....</u>	<u>46</u>	<u>50</u>	<u>99</u>	<u>107</u>
Technology Utilization.....	46	50	44	45
Commercial Use of Space.....	---	---	55	62
<u>Aeronautics and Space Technology.....</u>	<u>5,087</u>	<u>5,184</u>	<u>4,982</u>	<u>4,916</u>
Aeronautical research and technology.....	3,745	3,762	3,621	3,561
Space research and technology.....	1,342	1,422	1,361	1,355
<u>Tracking and Data Acquisition.....</u>	<u>28</u>	<u>32</u>	<u>34</u>	<u>31</u>
<u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS.....</u>	<u>4,951</u>	<u>4,321</u>	<u>4,366</u>	<u>3,838</u>
Shuttle Production and Operational Capability.....	1,145	767	1,058	814
Space Transportation Operations.....	3,086	2,828	2,607	2,338
Space and Ground Network, Communications and Data Systems.....	720	726	701	686
Subtotal, Direct.....	16,261	16,309	16,333	16,308
<u>CENTER MANAGEMENT AND OPERATIONS SUPPORT.....</u>	<u>4,937</u>	<u>4,808</u>	<u>4,831</u>	<u>4,631</u>
Subtotal, full-time permanents.....	21,198	21,117	21,164	20,939
Other than full-time permanents.....	882	883	836	861
Total, Permanent Positions.....	<u>22,080</u>	<u>22,000</u>		<u>21,800</u>

SUM 15

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1986 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

DISTRIBUTION OF BUDGET PLAN BY FUNCTION BY INSTALLATION

(Thousands of Dollars)

FUNCTION	Total NASA	Johnson Space Center	Kennedy Space Center	Marshall Space Flight Center	National Space Technology Laboratories	Goddard Space Flight Center	Ames Research Center	Langley Research Center	Lewis Research Center	Headquarters	Inspector General
<u>Personnel and Related Costs</u>											
1984 Actual.....	912,249	146,232	88,267	144,107	4,717	150,285	87,313	111,994	104,146	70,780	4,408
1985 Budget.....	935,928	151,041	90,137	144,451	4,735	154,955	90,592	115,058	108,264	71,943	4,752
1985 Current.....	956,303	153,164	92,588	148,862	5,014	157,626	91,978	117,523	110,037	74,396	5,115
1986 Estimate.....	931,813	149,298	90,463	144,783	4,879	153,815	89,672	114,605	107,852	71,424	5,022
<u>Travel</u>											
1984 Actual.....	25,644	3,961	2,038	4,479	182	3,739	2,306	2,534	2,045	4,151	209
1985 Budget.....	28,000	4,971	2,688	4,211	170	3,935	2,493	2,525	2,178	4,585	244
1985 Current.....	30,000	4,881	2,300	4,939	180	4,058	2,645	3,076	2,521	5,156	244
1986 Estimate.....	31,000	4,963	2,350	5,300	200	4,314	2,720	3,175	2,726	5,000	252
<u>Operation of Installation</u>											
1984 Actual.....	318,015	50,770	82,327	41,266	5,295	32,749	24,268	25,425	22,513	33,285	117
1985 Budget.....	367,072	58,093	88,024	46,602	6,000	40,400	30,031	30,454	30,061	37,085	322
1985 Current.....	349,997	53,933	87,092	43,775	5,746	37,798	26,904	28,132	26,700	39,398	519
1986 Estimate.....	382,187	59,452	96,518	45,722	6,052	41,590	31,516	31,279	29,318	40,411	329
<u>TOTAL</u>											
1984 Actual.....	1,255,908	200,963	172,632	189,852	10,194	186,773	113,887	139,953	128,704	108,216	4,734
1985 Budget.....	1,331,000	214,105	180,849	195,264	10,905	199,290	123,116	148,037	140,503	113,613	5,318
1985 Current.....	1,336,300	211,978	181,980	197,576	10,940	199,482	121,527	148,731	139,258	118,950	5,878
1986 Estimate.....	1,345,000	213,713	189,331	195,805	11,131	199,719	123,908	149,059	139,896	116,835	5,603

## NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

### PROPOSED APPROPRIATION LANGUAGE

#### RESEARCH AND PROGRAM MANAGEMENT

For necessary expenses of research in government laboratories, management of programs and other activities of the National Aeronautics and Space Administration, not otherwise provided for, including uniforms or allowances therefor, as authorized by law (5 U.S.C. 5901-5902); awards; lease, hire, maintenance and operation of administrative aircraft; purchase (not to exceed thirty for replacement only) and hire of passenger motor vehicles; and maintenance and repair of real and personal property, and not in excess of \$100,000 per project for construction of new facilities and additions to existing facilities, repairs, and rehabilitation and modification of facilities; ~~[\$1,317,000,000:] 1,345,000,000:~~ Provided, That contracts may be entered into under this appropriation for maintenance and operation of facilities, and for other services, to be provided during the next fiscal year: **Provided further**, That not to exceed \$35,000 of the foregoing amount shall be available for scientific consultations or extraordinary expense, to be expended upon the approval or authority of the Administrator and his determination shall be final and conclusive: **Provided further**, That the National Aeronautics and Space Administration [may test] **will continue** a flat rate per diem system for employee travel allowances under regulations prescribed by the Administrator: **Provided further**, That the rates will be consistent with those authorized by the Administrator of the General Services Administration: **Provided further**, That per diem allowances paid employees under a flat ~~rete~~ per diem system shall be **amounts** determined by the Administrator of NASA to ~~be~~ sufficient to meet normal and necessary expenses in the area in which travel is performed, but in no event will the travel allowances exceed \$75 for each day in travel status within the continental United States, unless the statutory maximum rate of \$75 per day is increased by the Congress and implemented by the Administrator of the General Services Administration : **Provided further**, That the flat rate per diem system approved under this section shall expire upon the effective date of permanent legislation establishing a flat rate per diem system for civilian personnel.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RESEARCH AND PROGRAM MANAGEMENT

PROGRAM AND FINANCING  
(in thousands of dollars)

		Costs and obligations		
		1984	1985	1986
		actual	estimate	estimate
Identification code 80-0103-0-1-999				
<b>Program by activities:</b>				
Direct program:				
1.	Space transportation systems.....	507,987	567,100	581,200
2.	Scientific investigations in space.....	216,836	223,600	222,400
3.	Space and terrestrial applications.....	121,145	119,100	119,300
4.	Space research and technology.....	97,176	106,300	107,900
5.	Aeronautical research and technology.....	257,699	265,600	255,000
7.	Supporting activity.....	55,065	58,600	59,200
	Subtotal direct program.....	1,255,908	1,340,300	1,345,000
	Total reimbursable program.....	46,730	40,000	36,000
10.00	Total obligations.....	1,302,638	1,380,300	1,381,000
<b>Financing:</b>				
Offsetting collections from:				
11.00	Federal funds.....	-25,700	-22,000	-20,000
14.00	Non-Federal sources.....	-21,030	-18,000	-16,000
21.40	Unobligated balance, start of year.....	---	---	---
24.40	Unobligated balance, end of year.....	---	---	---
25.00	Unobligated balance lapsing.....	174	---	---
39.00	Budget authority.....	1,256,082	1,340,300	1,345,000



		Costs and obligations		
		1984	1985	1986
Identification code 80-0103-0-1-999		actual	estimate	estimate
<hr/>				
Budget authority:				
40.00	<b>Appropriation.....</b>	1,256,082	1,317,000	1,345,000
44.20	<b>Supplemental for civilian pay raises.....</b>	---	23,300	---
<hr/>				
Relation of obligations to outlays:				
71.00	Obligations incurred, net.....	1,255,908	1,340,300	1,345,000
72.40	Obligated balance, start of year.....	89,931	110,698	115,698
74.40	Obligated balance, end of year.....	- 110,698	- 115,698	- 115,698
77.00	Adjustments in expired accounts.....	-2,718	---	---
<hr/>				
99.00	Outlays, excluding pay raise supplemental.....	1,232,423	1,312,000	1,345,000
91.20	Outlays from civilian pay raise supplemental.....	---	23,300	---
<hr/>				

**SUMMARY OF BUDGET AUTHORITY AND OUTLAYS**  
(in thousands of dollars)

Enacted/requested:				
Budget authority.....	.....	1,256,082	1,340,300	1,345,000
Outlays.....	.....	1,232,422	1,335,300	1,345,000
Recission proposal:				
Budget authority.....	.....	---	-4,000	---
Outlays.....	.....	---	-4,000	---
Total:				
Budget authority.....	.....	1,256,082	1,336,300	1,345,000
Outlays.....	.....	1,232,422	1,331,300	1,345,000

JOHNSON  
SPACE CENTER

/



## **RESEARCH AND PROGRAM MANAGEMENT**

### **FISCAL YEAR 1986 ESTIMATES**

#### **LYNDON B. JOHNSON SPACE CENTER**

##### **DESCRIPTION**

The Lyndon B. Johnson Space Center (JSC) is located approximately 20 miles southeast of downtown Houston, Texas. Total NASA-owned land at the Houston site consists of 1,620 acres. The Center also utilizes an additional 54,080 acres at the White Sands Test Facility, Las Cruces, New Mexico. The total capital investment of the JSC, including fixed assets in progress and contractor-held facilities at various locations and the White Sands Test Facility, as of September 30, 1984 was \$890,574,000.

##### **CENTER ROLES AND MISSIONS**

JSC was established in November 1961, in response to the need in NASA for a Center to manage the design, development and manufacture of manned spacecraft; for selection and training of astronaut crews; and the conduct of manned space flight missions. This need continued as the Nation proceeded toward more ambitious undertakings such as the Apollo program, the Skylab program, the Apollo-Soyuz Test Project, the Space Shuttle program, and the current definition phase of the Space Station program. To meet this responsibility, JSC has developed unique areas of recognized technical excellence within the civil service staff and facilities of superior merit; which constitute a National resource. The principal and supporting roles are:

Space Station - lead Center for management of the definition phase contracts, in-house systems engineering and integration, utilization, advanced development, focused technology and operational readiness. Includes station configuration management, station subsystem development and overall system design.

Manned Vehicles - development of manned space vehicles and associated supporting technology, including:

Space Shuttle Production and Operations Capability - development of the Orbiter and lead Center for management of the Shuttle system; providing sustaining engineering and logistic support for Space Transportation System (STS) hardware, including Shuttle configuration management, Shuttle sustaining engineering and Orbiter operational procurement.

STS Operations - operational planning, crew selection and training, medical operations, STS flight control, experiment/payload flight control for attached payloads and STS utilization planning/payload accommodation studies.

Environmental and Crew Support Systems - develop and demonstrate Environmental Control and Life Support Subsystems and Extravehicular Activity systems suitable for STS and other advanced needs.

Environmental Effects Analysis - manage efforts to develop the data base and conduct analyses to ascertain any environmental impact of STS operations.

Supporting Technology Advanced Developments - development of prototypes, long lead time systems and new procedures and software for advanced systems.

Advanced Missions - manage studies to define advanced transportation and orbital systems.

Life Sciences:

Medical Research - establish human baseline data, investigate and develop countermeasures to solve space medicine problems, and develop information techniques and equipment to support medical operation and medical experiments.

Food Systems Technology - develop nutritional requirements and food processing systems in support of human space flight.

Spacelab Payload - development of Spacelab life sciences research capability through common operating research equipment development; definition and development of in-flight biomedical experiments.

Lunar and Planetary Geosciences - develop and maintain technical discipline base for lunar and planetary geosciences and planetary material handling techniques.

Technology Experiments in Space - manage the Orbiter Experiments Program; definition and development of experiments in areas consistent with other JSC space roles.

Remote Sensing - designing, developing and testing spaceborne instruments used to measure various phenomena on or above the Earth from space. Includes development of techniques to process and understand the data received and to use it.

DISTRIBUTION OF PERMANENT CIVIL SERVICE WORKYEARS BY PROGRAM

	1984 <u>Actual</u>	1985 <u>Budget</u> <u>Estimate</u>	1985 <u>Current</u> <u>Estimate</u>	1986 <u>Budget</u> <u>Estimate</u>
<b><u>RESEARCH AND DEVELOPMENT</u>.....</b>	<b><u>906</u></b>	<b><u>1. 097</u></b>	<b><u>1. 211</u></b>	<b><u>1. 319</u></b>
<u>Space Station</u> .....	189	200	513	620
<u>Space Transportation Capability Development</u> .....	43 1	653	475	489
<u>Space Science and Applications</u> .....	227	192	160	146
Physics and Astronomy.....	24	11	24	---
Life Sciences.....	117	99	87	85
Planetary Exploration.....	35	23	31	31
Space Applications.....	51	59	18	30
<u>Commercial Programs</u> .....	1	1	5	6
Technology Utilization.....	1	1	1	1
Commercial Use of Space.....	---	---	4	5
<u>Aeronautics and Space Technology</u> .....	58	51	58	58
Aeronautical.....	5	5	5	5
Space.....	53	46	53	53
<b><u>SPACE FLIGHT ■ CONTROL AND DATA COMMUNICATIONS</u>.....</b>	<b><u>1. 770</u></b>	<b><u>1.675</u></b>	<b><u>1.501</u></b>	<b><u>1. 394</u></b>
Shuttle Production and Operations Capability.....	523	619	458	388
Space Transportation Operations.....	1,247	1,056	1. 043	1. 006
Total. direct workyears .....	2. 676	2. 772	2. 712	2. 713
<b><u>CENTER MANAGEMENT AND OPERATIONS SUPPORT</u>.....</b>	<b><u>520</u></b>	<b><u>437</u></b>	<b><u>510</u></b>	<b><u>488</u></b>
Total. Full-time workyears .....	3. 196	3. 209	3. 222	3. 201
Other than Full-time.....	118	113	101	100
Total. workyears .....	<u>3. 314</u>	<u>3. 322</u>	<u>3. 323</u>	<u>3. 301</u>

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan by Function

	1984	<u>1985</u>		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	146,232	151,041	153,164	149,298
11. Travel.....	3,961	4,971	4,881	4,963
111. Operation of Installation.....	50,770	58,093	53 ,933	59,452
A. Facilities Services.....	(25,787)	(31,536)	(28,757)	(33,911)
B. Technical Services.....	( 7,947)	( 7,571)	( 6,972)	( 8,916)
C. Management and Operations.....	<u>(17,036)</u>	<u>(18,986)</u>	<u>(18,204)</u>	<u>16,625)</u>
Total, fund requirements.....	<u>200,963</u>	<u>214,105</u>	<u>211,978</u>	<u>213,713</u>

PROGRAM DESCRIPTION

Permanent Civil  
Service Workyears

RCH AND DEVELOPMENT

SPACE STATION.....

620

The staffing plan provides management activities to support the Space Station program definition phase efforts for which JSC is responsible. It also provides for continuing effort in systems engineering and integration (SE&I), advanced development, focused technology, utilization, and operational readiness necessary to provide products to the definition and preliminary design contractors.

The Station program requires a coordinated effort across disciplines to insure that all functions are adequately addressed in the definition phase. NASA has made a commitment to undertake the systems engineering and integration (SE&I) of the total Space Station in-house. SE&I products will provide the capability for simulations of docking and berthing, on-orbit assembly of large structures, total on-orbit operational simulations integrating various elements such as the STS, OMV/OTV and the Space Station. These capabilities are important to the definition of requirements and overall design of the Space Station systems. Models of various subsystems will also be produced to support the in-house ability to evaluate results of the definition contractor efforts.

Other activities include lead Center responsibilities in the advanced development areas of communications, data management, ECLSS, EVA, human productivity, and thermal management as well as management of the definition of overall structures and architecture of the Space Station systems, outfitting of the habitation module, definition of the EVA requirements, thermal management, mechanisms, airlock, data management, communications and tracking.

Utilization efforts will identify potential users and define the payload requirements for science, commercial and technology development missions which will drive the design of the overall Space Station systems capabilities to provide user friendly and cost effective services.

Operational readiness of the Space Station will be dependent on the systems developed to support ground and on-orbit requirements. The integration of technical and user requirements to support long-term systems functions necessitate the beginning of operations readiness early in the life of the Space Station as will on-orbit crew training, fault detection, proper balances of work and recreation, etc.

Crew involvement in the definition process provides insight into future payload operations on the Space Station as will defining Space Station and STS interfaces.

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT..... 489

The 1986 staffing for space transportation capability provides for continuation of the Shuttle production activities to support a schedule consistent with the major program milestones. It also provides development, integration, and operations support for the Mission Control Center, Payload Operations Control Center, upper stages, and specific payload requirements for optional services.

The support of the Spacelab development effort includes establishing and controlling Shuttle interface with the Spacelab for overall safety requirements for the Shuttle/Spacelab, and support of the Marshall Space Flight Center in the performance of its assigned responsibilities. JSC is responsible for crew mission training in conjunction with flight hardware and the development and operation of Shuttle/Spacelab simulators and trainers, as well as Spacelab support resident in the Orbiter general purpose computers.

Payload integration activities involve both the upper stages project and the tethered satellite system. For the upper stages, duties include the efforts necessary to integrate the interface between the Orbiter and the payload. JSC is involved with integrating the Interim Upper Stage, the Centaur G and G prime, the Transfer Orbit Stage, and the Payload Assist Module. JSC provides the support of payload-unique integration requirements for the Tethered Satellite System.

The Engineering and Technical Base (ETB) provides the base capability necessary to support ongoing and future efforts. The ETB supports a one-shift operation of the JSC laboratories and a two-shift operation of the Central computer facility.

Payload operations and support equipment provide optional services for payloads. These efforts involve performing analytical tasks for the payloads that require special analysis, and the building and modification of hardware for unique payloads, hardware that supports specific classes of payloads, or hardware that provides interfaces between the payload and the Orbiter.

The advanced programs activities at JSC are planned and administered to support current and future Agency programs. Major activities are designed to promote more efficient operations of the STS and emphasis has been placed on developing and enhancing satellite services to improve utilization of the Orbiter vehicle. Support to the development of upper stages and the integration of payloads have been and will continue to be major tasks of interest. Supporting technology activities are conducted to advance the use of artificial intelligence and its applications in pursuance of NASA's goals.



SPACE SCIENCE AND APPLICATIONS

**LIFE SCIENCES..... 85**

The Center has the lead role in evaluating human physiological changes associated with the space environment and providing effective countermeasures to assure crew health and optimal performance, e.g., the Space Adaption Syndrome activity which focuses on investigating the potential problems the space shuttle crew have in adjusting to the weightless environment of space. These experiments are also designed to utilize the space environment to accomplish medical and biological research. The Center will have mission management responsibility for dedicated Life Sciences Spacelab missions.

The medical activities provide for inflight contingencies involving on-board health services, training for the crew, ground-based support, and evaluation of proposed crew members. The objectives are supportive of the Center's responsibility for assuring the space shuttle crew health and safety, both during flight and on the ground. The accomplishment of these objectives requires a well defined and continuing program that incorporates medical research, operations, laboratory support, and clinical medicine.

The bioengineering activities include dedicated Life Sciences Spacelab experiments and real-time human experiments. To this end, science experiments have been selected, and experiment hardware development has been initiated. JSC has mission management responsibility for the life sciences payloads, which includes systems management and engineering of the payload equipment and operation of the payload during flight.

**PLANETARY EXPLORATION..... 31**

The Center supports the Agency's planetary exploration program in the area of geosciences where a strong, active research group is required to support future programs, provide curatorial support, assist in information dissemination and interact with outside scientists. To provide this support, the research group pursues research on the compositions, structures and evolutionary histories of the solid bodies of the solar system. The Center has an ongoing program of analysis of planetary materials and of remote sensing data, a theoretical studies program and a program which is involved in the development of remote sensing instrumentation. The definition of geoscience requirements for future planetary flight missions involves extensive interaction with the planetary science community.

**SPACE APPLICATIONS..... 30**

Space applications flight project responsibilities at JSC center around Shuttle payload instrument development. The Large Format Camera has been developed for flight on the Shuttle. Responding to airborne measurement requirements, JSC is also developing and implementing an aircraft sensors plan involving testing, maintenance, and operation of a wide variety of report sensors to provide data to investigators. JSC is assigned mission management responsibilities for the Earthward-looking remote sensing missions OSTA-5 and OSTA-7. This includes the mission planning, real-time mission control, mission requirements definition, and experiment integration.

COMMERCIAL PROGRAMS

**TECHNOLOGY UTILIZATION..... 1**

The Technology Utilization program transfers new knowledge and innovative technology resulting from NASA's research and development programs for application by the public sector.

**COMMERCIAL USE OF SPACE PROGRAM..... 5**

The objective of the Commercial Use of Space programs is to increase private sector awareness of space opportunities and encourage increased industry investment and participation in high technology space-based research and development. This effort will establish an organizational focal point to initiate a program specifically intended to foster commercial use and access to space.

AERONAUTICS AND SPACE TECHNOLOGY

**AERONAUTICAL RESEARCH AND TECHNOLOGY..... 5**

The Center is continuing its joint effort with the Langley Research Center on a study for the development of advanced information processing systems (AIPS) architecture which will meet the needs of future aircraft and spacecraft flight control systems. JSC is also studying the technology of a large capacity, extended length heat pipe radiator for construction and maintenance under zero-gravity operating conditions.

**SPACE RESEARCH AND TECHNOLOGY..... 53**

JSC is undertaking the study of a family of technologies for Space Station subsystems and improved STS operations. The technologies include: improvement of man-machine interactions in space, advanced thermal

concepts, evaluation of ADA language in NASA flight systems, environmentally controlled life support systems efficiencies, development of docking/berthing systems required for large space systems, data system architecture designs, and methodologies to improve cost effectiveness of GN&C systems.

Permanent Civil  
Service Workyears

**SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS**

**SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY.....** 388

The 1986 staffing provides for continuation of the Shuttle production activities to support a schedule consistent with the major program milestones. It also provides development, integration, and operations support for Mission Control Center and Payload Operations Control Center.

Activities consistent with a phased delivery of the total Orbiter fleet and procurement of necessary flight and ground support equipment will be continued including the lay-in of spares and structural spares. The National Space Transportation System Program Office of JSC has program management responsibility for program control, overall systems engineering, and Space Shuttle system integration. Providing management of the "lead center" functions as related to the Space Shuttle Project Office provides overall management of the production of the Orbiter system. This includes management of various elements of the total Orbiter system (e.g., structures, propulsion, power, avionics, etc.) and to lower elements within the subsystems. JSC is responsible for a relatively large quantity of supporting equipment. Examples of such equipment are: extra-vehicular mobility unit, closed circuit television, survival radio sets, dosimetry, crew equipment, photographic camera systems, and bioinstrumentation.

To integrate all vehicle systems into an efficient operating system, many detailed interfaces and functional performance features must be identified and defined. Specific interface control documents are identified and established, including both flight systems and flight to ground system. General capability and performance criteria are established for special areas of consideration such as electromagnetic compatibility and lightning protection. Systems operations require the preparation of systems performance data and operations information.

Since the Orbiter represents an integrated complex of technical and engineering disciplines, specific subtasks have been assigned to a variety of technical organizations at JSC. Included in these tasks are: providing technical expertise in the Orbiter life support systems; performing engineering analysis and performance evaluation for communication and tracking systems ground testing; providing expertise in guidance, navigation, control, instrumentation and electrical power distribution; management and operation of environmental test chamber; analysis and evaluation of the Orbiter hydraulics system, auxiliary power unit, orbital maneuvering system components, reaction control engine performance, and reaction control

system engine valve leak detection techniques; analysis of vehicle attachment and separation systems; analysis of total Shuttle systems, Shuttle/payload interface, crew station evaluation, and engineering analysis to determine overall vehicle performance characteristics in the area of aerodynamic performance, flight characteristics, performance, and dynamics including aeroelasticity.

The successful flight and operational performance of the Space Shuttle is dependent on the proper functioning of integrated electronic equipment. Collectively, these are termed the Integrated Avionics System. Avionics provide the Shuttle pilots and crew with the total assessment and command capability necessary to manage, fly, and operate the vehicle. Because of the critical nature of this system, very close attention is given to the identification of performance requirements and integrated performance.

A variety of avionic elements are included within the Space Shuttle system, each of which requires the attention of a group of technical experts. These elements include: guidance, navigation and control, data processing, communication and tracking, instrumentation, displays and control, solid rocket booster interface, electrical power distribution and control, and external tank instrumentation interface.

The MCC is being upgraded to provide the ability to separate a secure data string for Department of Defense Shuttle mission support. The POCC has been augmented to provide command and control support for attached payload flights.

Permanent Civil  
Service Workyears

**SPACE TRANSPORTATION OPERATIONS.....** 1,006

Space transportation operations staffing provides for Shuttle operational flight program management including vehicle system integration; Mission Control Center (MCC) operations; crew equipment and crew training; flight mission planning and operations; and procurement of orbiter flight spares and hardware.

Mission flight support includes a wide variety of planning activities ranging from operational concepts and techniques to detailed systems operational procedures and checklists. Tasks include preparation of development system and software handbooks, flight rules, detailed crew activity plans and procedures, development of MCC and network systems requirements, and operations input to the planning for the selection and operation of Shuttle payloads.

Operations flight design includes: the identification of operational requirements for the design of planned and improved spacecraft system; the development of flight techniques for utilization of these systems; and the development of nominal and contingency flight profiles for all Shuttle missions. This includes conceptual level profile development and analysis, beginning about two years before the flight, and operational profile development and analysis, accomplished immediately prior to the flight. The software

activities for operational flights also include the continued development, definition, and verification support of the guidance, targeting, and navigation systems software requirements of the Orbiter and MCC. Software changes for Orbiter improvements will upgrade vehicle capabilities and performance.

Specific flight planning activity encompasses the flight design, flight analysis, and software activities. The flight design tasks include supporting the crew training simulations and development of flight techniques. Flight design products include conceptual flight profiles and operational flight profiles which are issued for each flight. The software activities include the development, formulation, and verification support for the guidance, targeting, and navigation systems software requirements in the Orbiter and MCC. In addition, the flight dependent data colocated in the erasable memory (mission-to-mission changes) is developed from the flight design process for incorporation into the Orbiter software and MCC systems.

Avionics and software testing and checkout in the Electronics Systems Test Laboratory and the Shuttle Avionics Integration Laboratory will continue. The purpose of these laboratories is to verify the functional performance of the Shuttle Integrated Avionics Systems, validate the system design, and verify compatibility of the various radio frequency communication links.

Orbiter avionics software development will provide payload support. This will include general capabilities for Spacelab, and Upper Stages, with flexibility available to implement specific payload requirements as optional services.

Reconfiguration tools (hardware and software systems) to permit support of the high flight rates are being implemented in the Shuttle Mission Simulator complex and procedures training facility. The capability for near-continuous training of a number of flight crews for different types of missions with different payload requirements and on different Orbiters requires management and utilization of a very high volume of data. Therefore, automated tools are essential to support this pace of training. In addition, simulator system upgrades are continuously being made to keep up with changes to the Orbiter.

Furthermore, there is provision for rapid handling of mission-to-mission software changes (flight dependent data in erasable memory) and associated verification on a "near production line" basis because of the greater mission rates. To accommodate the production-line type of work, emphasis is being placed on software tools and the associated automatic data processing equipment hardware to support the Software Production Facility.

**CENTER MANAGEMENT AND OPERATIONS SUPPORT.....** **488**

Center Management and Operations Support is provided to all JSC organizations which cannot be identified exclusively to a single program or project. The civil service personnel involved in this support include the following:

Director and Staff - The Center Director, Deputy Director and immediate staff, e.g, Legal, Personnel, Equal Opportunity, Technical Planning, and Public Affairs.

Management Support - Those who will provide information and control service supporting all levels of Center management, both program and functional. Specific functions include resources and financial management, program control, contracting and procurement, property management, and management systems and analysis.

Operations Support - Those who manage or provide for the operation and maintenance of institutional facilities, buildings, systems, and equipment, including those who manage or provide technical services such as automatic data processing, reliability and quality assurance, medical care, and photographic support.

---

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>146, 232</u></b>	<b><u>151,041</u></b>	<b><u>153,164</u></b>	<b><u>149,298</u></b>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Full-time <del>permanent</del> .....	123,332	125,335	127,884	124,484
b. Other than full-time <del>permanent</del> .....	1,952	2,072	1,938	1,858
c. Reimbursable <del>detailees</del> .....	3,219	4,235	3,938	3,853
d. Overtime and other <del>compensation</del> .....	<u>2,117</u>	<u>1,999</u>	<u>2,767</u>	<u>2,653</u>
Subtotal, Compensation.. ..	130,620	133,641	136,527	132,848
2. <u>Benefits</u> .....	<u>14,628</u>	<u>16,496</u>	<u>15,430</u>	<u>15,206</u>
Subtotal, Compensation and Benefits....	145,248	150,137	151,957	148,054
B. <u>Supporting Costs</u>				
1. Transfer of personnel.. ..	175	263	372	409
2. Personnel <del>training</del> .....	<u>809</u>	<u>641</u>	<u>835</u>	<u>835</u>
Subtotal, Supporting Costs.....	984	904	1,207	1,244
Total, Personnel and Related Costs .....	<u>146,232</u>	<u>151,041</u>	<u>153,164</u>	<u>149,298</u>

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u> .....	<u>145,248</u>	<u>150,137</u>	<u>151,957</u>	<u>148,054</u>
1. <u>Compensation</u> .....	<u>130,620</u>	<u>133,641</u>	<u>136,527</u>	<u>132,848</u>
a. Full-time permanent.....	123,332	125,335	127,884	124,484

The current estimate for 1985 reflects a change from the 1985 budget estimate due to the 1985 pay raise partially offset by a reduction in the anticipated cost per equivalent work year. The 1986 estimate reflects a reduction due to the President's Management Improvement Initiative and the proposed reduction in pay rates.

#### Basis of Cost for Full-time Workyears

In 1986, the cost of full-time workyears will be \$124,484,000, a decrease of \$3,400,000 from 1985. The decrease is calculated as follows:

Cost of full-time permanent workyears in 1985.....	127,884
Cost Increases in 1986.....	4,275
Within-grade and career advances.....	2,769
Full year cost of 1985 actions.....	1,193
Part year cost of 1986 actions.....	1,576
Full year cost of 1985 pay raise.....	1,076
Alteration in the method of calculating salaries paid.....	430
Cost Decreases in 1986.....	-7,675
Turnover savings and abolished positions.. ..	-809
Full year cost of 1985 actions.....	-264
Part year cost of 1986 actions.....	-545
1986 FTE reduction.....	-792
Proposed governmentwide salary reduction.....	-6,074
Cost of full-time permanent workyears in 1986.....	<u>124,484</u>



	1984	1985		1986
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full-time permanent				
1. <del>cost</del> .....	1,952	2,072	1,938	1,858
2. Workyears.....	159	158	145	144

The distribution of 1986 workyears is as follows:

Distribution of Other than Full-Time Workyears

<u>Program</u>	<u>Workyears</u>
Development <del>programs</del> .....	78
Summer <b>programs</b> .....	8
Other temporary <del>programs</del> .....	14
Youth Opportunity <del>Programs</del> .....	<u>44</u>
<u>Total</u> .....	<u>144</u>

The reductions from the 1985 Budget estimate result because of a change in the FTE mix between permanent and temporary workyears. The reduction in 1986 results from the Governmentwide reduction in salary rates.

c. Reimbursable <b>detailees</b> .....	3,219	4,235	3,938	3,853
--	-------	-------	-------	-------

The military personnel detailed to the Johnson Space Center on a reimbursable basis are individuals experienced in manned space flight and related fields. Each individual performs a function essential and critical to current and future programs. The decrease from the 1985 budget estimate to the 1985 current estimate **is** due to a lower than anticipated cost increase from DOD and fewer than projected new astronauts. **FY 1986** is at the same level as 1985.

d. Overtime and other compensation.....	2,117	1,999	2,767	2,653
---	-------	-------	-------	-------

Overtime in 1986 will be used primarily in support of Shuttle flights; e.g., crew training, trajectory optimization, data reduction integration laboratory, and related support activities. The

increase from the 1985 estimate to the 1985 current estimate reflects 1984 experience and the increased Shuttle flight rate.

	1984	1985		1986
	Actual	Budget Estimate	Current Estimate	Budget Estimate
(Thousands of Dollars)				
2. <u>Benefits</u> .....	<u>14,628</u>	<u>16,496</u>	<u>15,430</u>	<u>15,206</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	8,642	9,115	8,939	8,669
Employee Life Insurance.....	338	356	352	346
Employee Health Insurance.....	3,488	4,341	3,632	3,594
Workmen's Compensation.. ..	642	600	640	609
FICA.....	141	665	427	600
Medicare.....	1,356	1,409	1,417	1,366
Other benefits.....	<u>21</u>	<u>10</u>	<u>23</u>	<u>22</u>
Total.....	<u>14,628</u>	<u>16,496</u>	<u>15,430</u>	<u>15,206</u>

The decrease from the 1985 budget estimate to the 1985 current estimate is due primarily to lower than anticipated costs in 1984, upon which 1985 costs are based. The Workmen's Compensation estimates for 1985 and 1986 reflect estimates based on Department of Labor billings. The decrease from 1985 to 1986 reflects the proposed reductions in pay rates and their attendant benefits as well as the reduction in administrative workyears.

B. <u>Supporting Costs</u> .....	<u>984</u>	<u>904</u>	<u>1,207</u>	<u>1,244</u>
1. <u>Transfer of Personnel</u> .....	<u>175</u>	<u>263</u>	<u>372</u>	<u>409</u>

The transfer of personnel includes movement of household goods, subsistence and temporary expenses, real estate and miscellaneous moving expenses related to change of duty stations. The increase in FY 1986 reflects expected increases in transportation rates.

2. <u>Personnel Training</u> .....	<u>809</u>	<u>641</u>	<u>835</u>	<u>835</u>
------------------------------------	------------	------------	------------	------------

The purpose of the JSC training program is to continue the development of skills and knowledge of civil service employees in order to maintain a state of the art technology to more efficiently support JSC

roles and missions. The increase from the 1985 Budget Estimate to the 1985 Current Estimate reflects a small increase in the level of training as well as an increase in projected tuition and other training costs.

---

	1984 <u>Actual</u>	1985 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1985 <u>Current</u> <u>Estimate</u>	1986 <u>Budget</u> <u>Estimate</u>
II. <u>TRAVEL</u> .....	<u>3,961</u>	<u>4,971</u>	<u>4,881</u>	<u>4,963</u>

Summary of Fund Requirements

A. Program <del>Tae</del> .....	3,100	3,959	3,840	3,933
B. Scientific and Technical Developement Travel....	277	490	490	507
C. Management and Operations <del>Tae</del> .....	<u>584</u>	<u>522</u>	<u>551</u>	<u>523</u>
Total, <del>Tae</del> .....	<u>3,961</u>	<u>4,971</u>	<u>4,881</u>	<u>4,963</u>

	1984	1985		1986
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
	<u>Explanation of Fund Requirements</u>			
A. <u>Program Travel</u> .....	<u>3,100</u>	<u>3,959</u>	<u>3,840</u>	<u>3,933</u>

Program Travel is specifically required for accomplishment of the Center's mission and accounts for approximately 80 percent of the travel budget for 1986. The 1985 and 1986 travel supports the planned increase of support to Space Station activities. All other program travel remains unchanged. Travel is required to support operations activity including launch, mission support, coordination of engineering and technical activities, and support of payload technical integration. The decrease from the 1985 budget estimate to the 1985 current estimate reflects 1984 experience and the number of STS operational missions. The 1986 estimate reflects expected increases in transportation costs.

B. <u>Scientific and Technical Development Travel</u> ....	<u>277</u>	<u>490</u>	<u>490</u>	<u>507</u>
--	------------	------------	------------	------------

Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community.

C. <u>Management and Operations Travel</u> .....	<u>584</u>	<u>522</u>	<u>551</u>	<u>523</u>
--	------------	------------	------------	------------

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; and local transportation. The increases from the 1985 budget estimate to the 1985 current estimate reflects a level somewhat below that experienced in FY 1984. The decrease in 1986 is part of the President's Management Improvement Initiative.

---

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
<b>III. <u>OPERATION OF INSTALLATION</u>.....</b>	<b><u>50,770</u></b>	<b><u>58,093</u></b>	<b><u>53,933</u></b>	<b><u>59,452</u></b>

Summary of Fund Requirements

A. Facilities <b>Services</b> .....	25,787	31,536	28,757	33,911
B. Technical <del>Services</del> .....	7,947	7,571	6,972	8,916
C. Management and Operations.....	<u>17,036</u>	<u>18,986</u>	<u>18,204</u>	<u>16,625</u>
Total, Operation of Installation.....	<u>50,770</u>	<u>58,093</u>	<u>53,933</u>	<u>59,452</u>

Explanation of Fund Requirements

Operation of Installation provides a broad range of services, supplies, and equipment in support of the Center's institutional activities. These are divided into three major functional areas: Facilities Services, the cost of maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; Technical Services, the cost of automatic data processing for management activities; and the cost of educational and informational programs and technical shops supporting institutional activities; and Management and Operations, the cost of administrative communications, printing, transportation, medical, supply, and related services.

The change from the 1985 budget estimate to the 1985 current estimate is an overall reduction due to a decrease in anticipated utility costs and elimination of the maintenance augmentation offset by increases in the areas of contractor rates, ADP operation and facility maintenance. The increase in 1986 results from estimated utility, contractor support and other goods and services rate increases, partially offset by the reduction in the Management and Operations subcategory because of the President's Management Improvement Initiative.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. <u>FACILITIES SERVICES</u> .....	<u>25,787</u>	<u>31,536</u>	<u>28,757</u>	<u>33,911</u>

This physical plan supports an average daily on-site population of approximately 8,200 personnel plus an additional 3,000 personnel located at nearby facilities and Ellington Air Force Base. These budget estimates also include resources associated with the physical plant requirements of the White Sands Test Facility and for facilities used at Ellington Air Force Base.

#### Summary of Fund Requirements

1. Maintenance and Related Services.....	7,250	9,903	8,400	11,368
2. Custodial Services.....	5,229	5,323	4,933	5,687
3. Utility Services.....	<u>13,308</u>	<u>16,310</u>	<u>15,424</u>	<u>16,856</u>
Total, Facilities Services.....	<u>25,787</u>	<u>31,536</u>	<u>28,757</u>	<u>33,911</u>

#### Explanation of Fund Requirements

1. <u>Maintenance and Related Services</u> .....	<u>7,250</u>	<u>9,903</u>	<u>8,400</u>	<u>11,368</u>
--	--------------	--------------	--------------	---------------

This activity involves routine maintenance and facilities support for JSC at Houston, as well as White Sands Test Facility and Ellington Air Force Base, and includes such activities as support for utility systems; administrative office alterations and painting; ground maintenance; and other facility and system design and modification tasks. The decrease from the 1985 budget estimate to the 1985 current estimate is a net reduction resulting from an increase for repairs to the Center's fire alarm and Fire Suppression System and the non-appropriation of the NASA-wide maintenance augmentation effort. The increase from 1985 to 1986 is due to support service contractor rate increases, and new minor construction, alterations and repair projects.

	1984	1985		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. <u>Custodial Services</u> .....	<u>5,229</u>	<u>5,323</u>	<u>4,933</u>	<u>5,687</u>

This activity involves support contractor effort at JSC to provide security guard services such as protection of government facilities, equipment, and classified information and badging for all on-site personnel and official visitors; janitorial services (including highly specialized cleanroom services); and fire protection services such as maintenance of alarms and fixed fire fighting equipment, and industrial safety and inspection. The decrease from the 1985 budget estimate to the 1985 current estimate is the result of decreases in support contractor wage rate and decreases in janitorial services. The increase in 1986 is due to expected support contract rate increases.

3. <u>Utility Services</u> .....	<u>13,308</u>	<u>16,310</u>	<u>15,424</u>	<u>16,856</u>
----------------------------------	---------------	---------------	---------------	---------------

This category includes purchased utilities and support contractor effort for the operation and maintenance of the utility distribution system. The net decrease from the 1985 budget estimate to the 1985 current estimate is due to lower utility cost rate based on FY 1984 experience offset by a higher utility consumption related to Shuttle mission activities. The 1986 increase is utility and support contractor rate increases.



	1984 <u>Actual</u>	<u>1985</u> Budget      Current <u>Estimate</u> <u>Estimate</u>		1986 Budget <u>Estimate</u>
		(Thousands of Dollars)		
B. TECHNICAL SERVICES.....	<u>7,947</u>	<u>7,571</u>	<u>6,972</u>	<u>8,916</u>

Summary of Fund Requirements

1. Automatic Data Processing.....	<u>4,494</u>	<u>4,027</u>	<u>3,806</u>	<u>4,955</u>
a. Equipment .....	406	665	878	595
b. Operations.....	4,088	3,362	2,928	4,360
2. Scientific and Technical Information.....	<u>2,445</u>	<u>2,459</u>	<u>2,081</u>	<u>2,810</u>
3. Shop and Support Services.....	<u>7,008</u>	<u>1,085</u>	<u>1,085</u>	<u>1,151</u>
Total, Technical Services.....	<u>7,947</u>	<u>7,571</u>	<u>6,972</u>	<u>8,916</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u> , .....	<u>4,494</u>	<u>4,027</u>	<u>3,806</u>	<u>4,955</u>
---	--------------	--------------	--------------	--------------

This activity provides support to all JSC administrative ADP functions; included within this area are institutional portions of lease and maintenance costs of hardware systems within the Central Computer Facility, as well as contractor effort for computer programming, operations, keypunch, and other support personnel. The ADP systems supported include institutional management, finance and accounting, procurement, contract status and tracking, personnel management, and utility tracking. The decrease from the 1985 budget estimate to the 1985 current estimate is due to reduction of central computing facility support contractor effort. The 1986 increase is due to support contract rate increases.

2. <u>Scientific and Technical Information</u> .....	<u>2,445</u>	<u>2,459</u>	<u>2,081</u>	<u>2,810</u>
--	--------------	--------------	--------------	--------------

This activity provides for a public affairs educational and informational program and support to the Center in provision of various scientific and technical information services. Included in the public affairs program are: motion picture production from script to screen; film clip preparation; exhibit management and refurbishment; visitor orientation tours; lecturing; mail answering service; and other public

affairs activities. The decrease from the 1985 budget estimate to the 1985 current estimate is due to a reduction in support contractor workyears. The increase in 1986 reflects expected contract rate increases.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Shop and Support Services</u> .....	<u>1,008</u>	<u>1,085</u>	<u>1,085</u>	<u>1,151</u>

These funds provide for a support contractor who provides JSC graphics and photographic services. Graphic materials are prepared for use in presentations and senior management reviews. Various kinds of films are processed and reproductions and reprints made. The increase in 1986 reflects support contract rate increases.

	1984 <u>Actual</u>	1985 <u>Budget Estimate</u> (Thousands of Dollars)	1985 <u>Current Estimate</u>	1986 <u>Budget Estimate</u>
C. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>17,036</u>	<u>18,986</u>	<u>18,204</u>	<u>16,625</u>
1. Administrative Communications.....	5,393	6,876	6,113	5,122
2. Printing and Reproduction.....	206	247	247	259
3. Transportation.....	2,244	2,898	2,714	2,566
4. Installation Common Services.....	<u>9,193</u>	<u>8,965</u>	<u>9,130</u>	<u>8,678</u>
Total, Management and Operations.....	<u>17,036</u>	<u>18,986</u>	<u>18,204</u>	<u>16,625</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>5,393</u>	<u>6,876</u>	<u>6,113</u>	<u>5,122</u>
---	--------------	--------------	--------------	--------------

Communications support for JSC and WSTF consists of local and long distance telephone service, and other communications services. Local service includes Centrex lines and telephones at JSC and WSTF. Long distance service includes the cost for FTS, commercial toll calls, and a small number of dedicated voice circuits. Other communications services include teletype and wire news services; the operation and maintenance of a closed circuit TV system; and local radio networks for fire, security and custodial uses. The reduction from the 1985 budget to the current estimates is due to more recent estimates for impact of deregulations and divestiture on local telephone rates and FY 1984 actual experience. The decrease in 1986 is due to the effect of the Governmentwide reduction in support costs.

2. <u>Printing and Reproduction</u> .....	<u>206</u>	<u>247</u>	<u>247</u>	<u>259</u>
---	------------	------------	------------	------------

Printing services are provided by on-site and off-site facilities. The on-site printing plant, operated by JSC personnel, produces approximately 60 million units each year. In addition to this on-site printing plant, JSC also purchases printing from private firms through Government Printing Office contracts, about 52,000,000 units each year. Purchased printing is overflow requirements that cannot be handled on-site, and printing which requires capabilities not available at the on-site plant. The increase in 1986 is the result of expected increases in supplies and material costs.

	1984		1985	1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

3. Transportation .....	<u>2,244</u>	<u>2,898</u>	<u>2,714</u>	<u>2,566</u>
-------------------------	--------------	--------------	--------------	--------------

Transportation includes administrative aircraft maintenance and fuel costs, lease of passenger vehicles and trucks, including GSA drivers and dispatchers and maintenance of vehicles. The decrease from the 1985 budget estimate to the 1985 current estimate is due to an anticipated decrease in aircraft parts replenishment purchases. The decrease in 1986 is part of the Governmentwide reduction in support costs.

4. Installation Common Services.....	<u>9,193</u>	<u>8,965</u>	<u>9,130</u>	<u>8,678</u>
--------------------------------------	--------------	--------------	--------------	--------------

These services support center management and staff activities, provide medical services, and cover various installation support services. Center management and staff functions include legal, personnel, procurement, and EEO activities. Medical services provided include occupational medicine and environmental health, consisting of the operation of the JSC on-site clinic; emergency assistance at Ellington Field; providing physicals for JSC personnel at Downey, California; medical consultation and crew test support; industrial hygiene; radiological health; and an environmental health laboratory. Installation support services include administrative supplies, materials and equipment at the Center and at White Sands Test Facility, JSC share of operating costs at Ellington Field; and miscellaneous administrative support. The decrease in 1986 is part of the Governmentwide reduction in support costs.

# LYNDON B. JOHNSON SPACE CENTER

STAFFING SUMMARY			
	FY85	FY86	FY87
SES	59	59	
EXCEPTED	1	1	
GS/GM-15	254	253	
GS/GM-14	481	480	
ALL OTHER GS/GM	2412	2453	
VAGE GRADE	16	16	
TOTAL	3283	3282	

DIRECTOR DEPUTY DIRECTOR ASSOCIATE DIRECTOR			
	FY85	FY86	FY87
SES	4	4	
GS/GM-15	0	0	
GS/GM-14	0	0	
ALL OTHER GS/GM	5	5	
TOTAL	9	9	

OFFICE OF INSPECTOR GENERAL JSC			
SES	0	0	
GS/GM-15	1	1	
GS/GM-14	4	4	
ALL OTHER GS/GM	49	49	
TOTAL	54	54	

PERSONNEL OFFICE			
SES	0	0	
GS/GM-15	1	1	
GS/GM-14	4	4	
ALL OTHER GS/GM	49	49	
TOTAL	54	54	

EQUAL OPPORTUNITY PROGRAMS OFFICE			
SES	0	0	
GS/GM-15	0	0	
GS/GM-14	1	1	
ALL OTHER GS/GM	6	6	
TOTAL	7	7	

LEGAL OFFICE			
SES	1	1	
GS/GM-15	2	2	
GS/GM-14	5	5	
ALL OTHER GS/GM	9	9	
TOTAL	17	17	

PUBLIC AFFAIRS OFFICE			
SES	1	1	
GS/GM-15	0	0	
GS/GM-14	4	4	
ALL OTHER GS/GM	24	24	
TOTAL	29	29	

TECHNICAL PLANNING OFFICE			
SES	1	1	
GS/GM-15	0	0	
GS/GM-14	0	0	
ALL OTHER GS/GM	2	2	
TOTAL	3	3	

NATIONAL SPACE TRANSPORTATION SYSTEMS PROGRAM OFFICE			
SES	4	4	
GS/GM-15	22	22	
GS/GM-14	40	40	
ALL OTHER GS/GM	76	76	
TOTAL	142	142	

SPACE SHUTTLE PROJECT OFFICE			
SES	5	5	
GS/GM-15	17	17	
GS/GM-14	41	41	
ALL OTHER GS/GM	76	76	
TOTAL	139	139	

SPACE STATION PROGRAM OFFICE			
SES	4	4	
GS/GM-15	13	13	
GS/GM-14	36	36	
ALL OTHER GS/GM	58	58	
TOTAL	111	111	

SPACE STATION PROJECTS OFFICE			
SES	3	3	
GS/GM-15	8	8	
GS/GM-14	19	19	
ALL OTHER GS/GM	20	20	
TOTAL	50	50	

DIRECTOR, SAFETY, RELIABILITY, AND QUALITY ASSURANCE			
SES	2	2	
GS/GM-15	15	15	
GS/GM-14	13	13	
ALL OTHER GS/GM	123	123	
TOTAL	153	153	

DIRECTOR OF SPACE OPERATIONS			
SES	2	2	
GS/GM-15	0	0	
GS/GM-14	0	0	
ALL OTHER GS/GM	2	2	
TOTAL	4	4	

DIRECTOR OF ENGINEERING AND RESEARCH			
SES	2	2	
GS/GM-15	0	0	
GS/GM-14	1	1	
ALL OTHER GS/GM	2	2	
TOTAL	5	5	

DIRECTOR OF CENTER SUPPORT			
SES	1	1	
GS/GM-15	0	0	
GS/GM-14	0	0	
ALL OTHER GS/GM	3	3	
TOTAL	4	4	

DIRECTOR, FLIGHT CREW OPERATIONS			
SES	3	3	
EXCEPTED	1	1	
GS/GM-15	23	23	
GS/GM-14	26	26	
ALL OTHER GS/GM	88	88	
TOTAL	141	141	

DIRECTOR, MISSION OPERATIONS			
SES	6	6	
GS/GM-15	21	21	
GS/GM-14	31	31	
ALL OTHER GS/GM	213	213	
TOTAL	331	331	

DIRECTOR, MISSION SUPPORT			
SES	3	3	
GS/GM-15	21	21	
GS/GM-14	49	49	
ALL OTHER GS/GM	361	361	
TOTAL	440	440	

DIRECTOR, ENGINEERING			
SES	8	8	
GS/GM-15	50	50	
GS/GM-14	115	115	
ALL OTHER GS/GM	478	478	
TOTAL	651	651	

DIRECTOR, SPACE AND LIFE SCIENCES			
SES	3	3	
GS/GM-15	24	24	
Gym-14	36	36	
ALL OTHER GS/GM	173	173	
TOTAL	236	236	

DIRECTOR, ADMINISTRATION AND PROGRAM SUPPORT			
SES	3	3	
GS/GM-15	21	20	
Gym-14	34	33	
ALL OTHER GS/GM	300	289	
TOTAL	358	345	

DIRECTOR, CENTER OPERATIONS			
SES	2	2	
GS/GM-15	7	7	
Gym-14	14	14	
ALL OTHER GS/GM	308	300	
YAM GRADE	16	16	
TOTAL	347	339	

TEST/TECHNICAL			
SES	1	1	
GS/GM-15	3	3	
GS/GM-14	6	6	
ALL OTHER GS/GM	36	36	
TOTAL	46	46	

KENNEDY  
SPACECENTER

## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1986 ESTIMATES

#### JOHN F. KENNEDY SPACE CENTER

##### DESCRIPTION

The John F. Kennedy Space Center (KSC) is located 50 miles east of Orlando, Florida. The total land and water area occupied by the installation is 139,305 acres. NASA owns 82,943 acres of that total. The remainder is comprised of the Banana River Causeway Easement (271 acres), the Indian River Causeway Easement (296 acres), and Florida-owned submerged lands with Deed of Dedication (55,795 acres).

Space Shuttle flights began at KSC in 1981 and will begin at Vandenberg Air Force Base, California in 1986. Expendable launch vehicle operations are conducted at both the Air Force's Eastern Space and Missile Center, at Cape Canaveral Air Force Station, Florida, and the Western Space and Missile Center at Vandenberg Air Force Base, California, which is located six miles west of Lompoc, California. Activities at Vandenberg are accomplished within a host-tenant agreement with the Air Force.

The NASA capital investment at KSC, Cape Canaveral Air Force Station, and Vandenberg Air Force Base, including fixed assets in progress and contractor-held facilities as of September 30, 1984, was \$1,443,332,000 .

##### CENTER ROLES AND MISSIONS

The Launch Operations Center was established at Cape Canaveral, Florida, in July 1962 to serve as the primary NASA center for the test, checkout, and launch of space vehicles. In late 1963, it was named the John F. Kennedy Space Center and in 1964 the Center was relocated to Merritt Island. This site was chosen because of its unique geographical characteristics, climate, local growth capability, accessibility, and availability. The Center has since become the major free world launch site with a unique civil service staff of unparalleled expertise in the test, checkout, and launch of space vehicles and in the design of associated ground support equipment. The technical facilities developed at KSC represent a recognized national resource. The principal roles of the Center are:

Space Transportation System Ground Operations - includes Space Shuttle launch preparation, launch, landing and refurbishment, Spacelab and Spacelab payloads ground processing, cargo/experiment integration and processing, upper stages ground processing, and operation and maintenance of ground support equipment.

Expendable Launch Vehicle Operations - includes launch preparation, checkout and launch for the current inventory of launch vehicles.

Space Station - Space Station effort at KSC will consist of activities in four major areas: Utilization, Advanced Development, System Engineering and Integration, and Operational Readiness.



# SUMMARY OF RESOURECES REQUIREMENTS

## FUNDING PLAN BY FUNCTION

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. PERSONNEL AND REALTED COSTS.....	88 ,267	90,137	92 ,588	90 ,463
II. TRAVEL.....	2,038	2 ,688	2,300	2 ,350
III. OPERATION OF INSTALLATION.....	82,327	88 ,024	87 ,092	96,518
A. FACILITIES SERVICES.....	(49,246)	(50,464)	(50 ,323)	(58,583)
B. TECHNICAL SERVICES.....	(8 ,506)	(8 ,784)	(8 ,784)	( 10 ,683)
C. MANAGEMENT AND OPERATIONS.....	<u>(24,575)</u>	<u>(28,776)</u>	<u>(27,985)</u>	<u>(27,252)</u>
TOTAL, FUND REQUIREMENTS.....	<u>172,632</u>	<u>180,849</u>	<u>181,980</u>	<u>189,331</u>

**DISTRIBUTION OF PERMANENT WORKYEARS BY PROGRAM**

	1984 <u>Actual</u>	1985 <u>Budget Estimate</u>	1985 <u>Current Estimate</u>	1986 <u>Budget Estimate</u>
<b><u>RESEARCH AND DEVELOPMENT.,.....</u></b>	<u>434</u>	<u>530</u>	<u>592</u>	<u>761</u>
<u>Space Station.....</u>	<u>60</u>	<u>100</u>	<u>185</u>	<u>366</u>
<u>Space Transportation Capability Development.,.....</u>	<u>233</u>	<u>297</u>	<u>265</u>	<u>271</u>
<u>Space Science &amp; Applications .....</u>	<u>138</u>	<u>111</u>	<u>134</u>	<u>114</u>
Physics & Astronomy.....	<u>132</u>	<u>108</u>	<u>128</u>	<u>108</u>
Life Sciences.....	<u>6</u>	<u>2</u>	<u>6</u>	<u>6</u>
Space Applications.....	<u>---</u>	<u>1</u>	<u>---</u>	<u>---</u>
<u>Commercial Programs.....</u>	<u>2</u>	<u>7</u>	<u>3</u>	<u>5</u>
Technology Utilization.....	<u>2</u>	<u>7</u>	<u>2</u>	<u>2</u>
Commercial Use of Space.....	<u>---</u>	<u>---</u>	<u>1</u>	<u>3</u>
<u>Aeronautics &amp; Space Technology .....</u>				
Space Research and Technology.....	<u>1</u>	<u>15</u>	<u>5</u>	<u>5</u>
<b><u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS.....</u></b>	<u>1123</u>	<u>1037</u>	<u>968</u>	<u>800</u>
Shuttle Production and Operational Capability.....	<u>159</u>	<u>126</u>	<u>126</u>	<u>66</u>
Space Transportation Operations.....	<u>964</u>	<u>911</u>	<u>842</u>	<u>734</u>
Subtotal, direct.....	<u>1,557</u>	<u>1,567</u>	<u>1,560</u>	<u>1,561</u>
<b><u>CENTER MANAGEMENT AND OPERATIONS SUPPORT.....</u></b>	<u>517</u>	<u>515</u>	<u>515</u>	<u>493</u>
Total, full-time workyears.....	<u>2,074</u>	<u>2,082</u>	<u>2,075</u>	<u>2,054</u>
Other than full-time workyears.....	<u>92</u>	<u>90</u>	<u>90</u>	<u>90</u>
Total, permanent workyears.....	<u>2,166</u>	<u>2,172</u>	<u>2,165</u>	<u>2,144</u>

## PROGRAM DESCRIPTION

Permanent Civil  
Service Workyears

### RESEARCH AND DEVELOPMENT

#### SPACE STATION..... 366

Space Station effort will consist of definition and integration studies, activities in the areas of utilizing advanced development and operational readiness.

#### SPACE TRANSPORTATION CAPABILITY DEVELOPMENT..... 271

The upper stages currently consist of the Inertial Upper Stage (IUS), Centaur, and the Payload Assist Module (PAM). These upper stages are expendable, propulsive stages intended for use in the deployment of Space Shuttle transported payloads to high energy orbits not attainable by the Space Shuttle alone.

The PAM has been developed, checked out and mated to a payload by the commercial developer, McDonnell Douglas. The Center has responsibility for integration of the PAM and its payload into the Shuttle payload bay. KSC is currently engaged in modifying the launch site facilities to accommodate the use of the Centaur as a Shuttle upper stage. These modifications, which affect all major launch facilities and in particular the launch pads and mobile launcher platforms, are planned for completion to support the Galileo and Ulysses missions in 1986.

The Center's role in the Spacelab program is similar to that of the Space Shuttle; that is, KSC is responsible for launch site development and for ground operations leading to the launch. KSC has responsibility for verifying that the Spacelab flight and ground systems are compatible with the Spacelab, with each other, and with safety requirements. The first Spacelab flight unit flew aboard STS-9 in November 1983.

KSC will provide facilities and support to the various developers and experimenters during processing. KSC, in concert with other NASA organizations must analyze potential payload users' requirements and activities. Based on experience gained during the Expendable Launch Vehicle program, KSC will monitor payload activity from conception; participate in design reviews to ensure compatibility with KSC facilities; and provide support coordination during the payload checkout and launch at KSC.

#### PHYSICS AND ASTRONOMY..... 108

KSC is responsible for planning and coordinating the integration of the Spacelab experiment with the Spacelab hardware system (Level IV integration). Interfaces are established and maintained with the NASA

discipline program offices, the principal investigators, and appropriate engineering groups to assure that scientific objectives of the mission are met.

Permanent Civil  
Service Workyears

**LIFE SCIENCES..... 6**

KSC will continue its support role in the definition, development and integration of biomedical experiments on the Space Shuttle for life sciences research. Included is the responsibility for providing and managing a Life Sciences Principal Investigator Support Facility and assisting in the conduct of life sciences synchronous ground control experiments and procedures required for these payloads. Experiments are designed to use the environment of space to accomplish medical and biological research.

**COMMERCIAL PROGRAMS**

**TECHNOLOGY UTILIZATION..... 2**

The objective of the Technology Utilization program is to encourage the use of and to expedite the application of new NASA technology to the public sectors.

**COMMERCIAL USE OF SPACE..... 3**

The objective of the Commercial Use of Space program is to increase private sector awareness of space opportunities and encourage increased industry investment and participation in high technology space-based research and development. This effort will establish an organizational focal point to initiate a program specifically intended to foster commercial use and access to space.

**AERONAUTICS AND SPACE TECHNOLOGY**

**SPACE RESEARCH AND TECHNOLOGY..... 5**

KSC work in space research and technology includes study efforts focusing on system operation and maintenance in space for future manned space systems such as Space Station.

**SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS**

**SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY..... 66**

With the **1986** initial use of Launch Pad B and Mobile Launch Platform 3, construction of most new launch support facilities and modifications of most existing facilities will be completed. The design,

modification or acquisition, installation and checkout of equipment and facilities to be used in support of increased launch rate requirements will continue. This includes equipment provided by KSC contractors, as well as equipment to be supplied by development contractors as part of their flight vehicle responsibilities.

The first Space Shuttle landed at KSC in February 1984. Although installation and checkout of initial operational systems are complete and the ground support equipment installed, there are ongoing new requirements and modifications to existing systems, including the Launch Processing System.

Support will continue for Launch Pad B construction activities, Launch Complex 39 modifications, and other modifications to facilities or equipment to meet Space Shuttle requirements including modifications on existing facilities to support the Centaur upper stage program.

Permanent Civil  
Service Workyears

SPACE TRANSPORTATION OPERATIONS..... 734

The operations role includes the test and checkout of each flight element as it arrives for flight; the integration of the elements (Orbiter, External Tank, Solid Rocket Boosters and their subsystems) into the Space Shuttle vehicle, and the integrated testing of the stacked configuration, propellant loading, and launch. Subsequent to landing, the Orbiter is refurbished by KSC in preparation for the next mission. KSC is responsible for retrieval and disassembly, of the expended Solid Rocket Boosters. The Center will also continue the refurbishment of selected existing support equipment for reuse in the Space Shuttle system. KSC is responsible for contingency landing site preparations for ferrying the Orbiter back to KSC.

Orbiter Vehicle (OV) 102, used in the orbital flight test program, and for the first operational flight was modified during 1983 at KSC for the initial Spacelab mission flown in November 1983. Orbiter Vehicle 099 arrived at KSC in July 1982; OV 103 arrived at Kennedy in late 1983; and OV 104 is scheduled to arrive in early 1985.

The Center is responsible for the launch preparation, checkout, support coordination during the payload checkout, and launch of the current inventory of expendable launch vehicles. This includes the Atlas Centaur and Delta vehicles. Launches at both the Eastern Space and Missile Center and Vandenberg Air Force Base are the responsibility of KSC.

CENTER MANAGEMENT AND OPERATIONS SUPPORT..... 493

Center Management and Operations Support provides support to all Kennedy Space Center organizations which cannot be identified exclusively to a single program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director, and the immediate staff, e g , Legal, Patent Counsel. Equal Opportunity, Public Affairs, and Safety.

Management Support - The part of the KSC civil service workforce that provides information and control services supporting all levels of center management, both program and functional. Specific functions include resources and financial management, program control, contracting and procurement, property management, personnel management, and management systems and analysis.

Operations Support - The part of the KSC civil service workforce that provides for the operation and maintenance of institutional facilities, buildings, systems and equipment, including those who manage or provide technical services such as automatic data processing, reliability and quality assurance, medical care, and photographic support.

RESOURCES REQUIREMENTS BY FUNCTION

	1984 <u>Actual</u>	1985 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1985 <u>Current</u> <u>Estimate</u>	1986 <u>Budget</u> <u>Estimate</u>
<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>88,267</u></b>	<b><u>90,137</u></b>	<b><u>92,588</u></b>	<b><u>90,463</u></b>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u> .....	87,331	89,065	90,981	89,056
1. <u>Compensation</u>				
a. Permanent positions.....	74,148	74,765	76,765	75,169
b. Other than full-time permanent positions	1,564	1,382	1,537	1,465
c. Reimbursable detailees.....	45	52	46	48
d. Overtime and other compensation.....	<u>2,443</u>	<u>3,017</u>	<u>2,620</u>	<u>2,617</u>
Subtotal, Compensation.....	78,200	79,216	80,968	79,299
2. <u>Benefits</u> .....	<u>9,131</u>	<u>9,849</u>	<u>10,013</u>	<u>9,757</u>
Subtotal, Compensation and Benefits.....	<u>87,331</u>	<u>89,065</u>	<u>90,981</u>	<u>89,056</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	241	450	985	785
2. Personnel training.....	<u>695</u>	<u>622</u>	<u>622</u>	<u>622</u>
Subtotal, Supporting Costs.....	<u>936</u>	<u>1,072</u>	<u>1,607</u>	<u>1,407</u>
Total, Personnel and Related Costs.....	<u>88,267</u>	<u>90,137</u>	<u>92,588</u>	<u>90,463</u>

### Explanation of Fund Requirements

	1984 <u>Actual</u>	1985		1986
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
<b>A. <u>Compensation and Benefits</u>.....</b>	<b><u>87,331</u></b>	<b><u>89,065</u></b>	<b><u>90,981</u></b>	<b><u>89,056</u></b>
1. <u>Compensation</u> .....	<u>78,200</u>	<u>79,216</u>	<u>80,968</u>	<u>79,299</u>
a. Permanent Positions.....	74,148	74,765	76,765	75,169

The current estimate for 1985 reflects a change from the 1985 budget estimate due to the increase in average salaries due to recent pay raises, plus increased workyears. The decrease in 1986 is due to the application of the changes required by the President's Management Improvement Initiative and the proposed reduction in pay rates.

### Basis of Cost for Permanent Positions

In 1986, the cost of permanent positions will be \$75,169,000, an decrease of \$1,596,000 over 1985. The increase is calculated as follows:

Cost of full-time permanent workyears in 1985.....	76,765
Cost Increases in 1986.....	3,405
Within-grade and career <del>advances</del> .....	1,372
Full year cost of 1985 actions.....	794
Part year cost of 1986 actions.....	578
Full year cost of 1985 pay raise.....	725
Change in reimbursements <del>received</del> .....	1,050
Alteration in the method of calculating salaries <del>paid</del> .....	258
Cost Decreases in 1986.....	-5,001
Turnover savings and abolished <del>positions</del> .....	-563
Full year cost of 1985 actions.....	-235
Part year cost of 1986 actions.....	-328
1986 FTE reduction.....	-792
Proposed governmentwide salary <del>reduction</del> .....	-3,646
Cost of full-time permanent workyears in 1986.....	75,169



	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full-time permanent positions				
(1) Cost.....	1,564	1,382	1,537	1,465
(2) <del>Workyears</del> .....	118	121	121	121

The distribution of 1986 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Other temporary programs.....	90
Youth Opportunity Programs.....	19
Summer Program.....	<u>12</u>
<u>Total</u> .....	<u>121</u>

The increase from the 1985 budget estimate to the 1985 current estimate resulted from the recent pay raise, realignment of the workyears in the various programs. The 1986 decrease reflects the proposed reduction in pay rates.

c. Reimbursable <del>detailees</del> .....	45	52	46	48
--	----	----	----	----

The military personnel detailed to Kennedy Space Center on a reimbursable basis is experienced in Shuttle Systems Engineering Office. The 1985 budget estimate and the 1985 current estimate is the same grade of Military as 1984 with the recent pay raise. The decrease of the current estimate reflects reporting date of detailees.

d. Overtime and other compensation.....	2,443	3,017	2,620	2,617
---	-------	-------	-------	-------

This item includes primarily overtime, holiday pay, night differential, Sunday premium and incentive awards. The estimates are essentially level from 1984 to 1986.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. <u>Benefits</u> .....	<u>9,131</u>	<u>9,849</u>	<u><del>10,013</del></u>	<u>9,757</u>
The following are the amounts of contribution by category:				
Civil Service Retirement Fund.....	5,458	5,799	5,688	5,503
Employee Life Insurance.....	217	230	226	220
Employee Health Insurance.....	2,199	2,499	2,291	2,217
Workmen's Compensation.....	308	325	215	244
FICA.. ..	51	45	52	52
Medicare.....	887	836	966	944
Other Benefits.....	<u>11</u>	<u>115</u>	<u>575</u>	<u>577</u>
Total.....	<u>9,131</u>	<u>9,849</u>	<u>10,013</u>	<u>9,757</u>

The increase from the 1985 budget estimate to the 1985 current estimate is primarily due to the 1985 pay increases. The overall decrease in 1986 is due to the proposed reduction in pay rates and the attendant benefits, as well as the reduction in administrative workyears.

<b>B. <u>Supporting Costs</u> .....</b>	<u>936</u>	<u>1,072</u>	<u>1,607</u>	<u>1,407</u>
1. Transfer of personnel.. ..	241	450	985	785

Transfer of personnel includes actual expenses involved in the movement and storage of employee's household goods. The increase in 1985 current estimate is due to increased hiring and increased transportation costs. FY 1986 reflects a reduction the number of anticipated relocations.

2. Personnel training.....	695	622	622	622
----------------------------	-----	-----	-----	-----

Training estimate remains the same for 1985 and 1986.

	1984	1985	1985	1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
11. <b><u>TRAVEL</u></b> .....	<b><u>2,038</u></b>	<b><u>2,688</u></b>	<b><u>2,300</u></b>	<b><u>2,350</u></b>

Summary of Fund Requirements

A. Program Travel.....	1,249	1,681	1,573	1,681
B. Scientific and Technical Development Travel.....	88	203	203	213
C. Management and Operations Travel.....	<u>701</u>	<u>804</u>	<u>524</u>	<u>456</u>
Total, Travel.....	<u>2,038</u>	<u>2,688</u>	<u>2,300</u>	<u>2,350</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>1,249</u>	<u>1,681</u>	<u>1,573</u>	<u>1,681</u>
--------------------------------	--------------	--------------	--------------	--------------

Program travel is directly related to the accomplishment of KSC's mission and accounts for approximately 72 percent of the Center's travel budget. Program travel reflects the continued involvement in launch site operations; the design, manufacturing, and testing of ground system equipment, and construction of facilities; and the activation of systems manufactured at off-site locations.

The current estimate for program travel is decreased from the 1985 budget estimate due to a realignment of program requirements. The increase in 1986 provides continued launch support for Spacelab and Payload flights, and Space Station Support for the first STS/Centaur launch, scheduled for April 1986.

B. <u>Scientific and Technical Development Travel</u> ...	<u>88</u>	<u>203</u>	<u>203</u>	<u>213</u>
---	-----------	------------	------------	------------

Scientific and Technical Development Travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside KSC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the government. The increase in 1986 reflects anticipated price levels.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Management and Operations Travel</u> .....	<u>701</u>	<u>804</u>	<u>524</u>	<u>456</u>

Management and Operations Travel is used for the direction and coordination of general management matters. It includes travel concerning such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters, and other NASA Centers; and local transportation. Local travel includes personal travel in and around the official station of the employer, including tolls, parking fees, and taxis. Non-NASA travel includes transportation of persons per diem and other incidental expenses for all non-NASA employees, such as unpaid advisory committee members and preemployment interviews for NASA SES positions. The decrease from the 1985 budget estimate to the 1985 current estimate reflects a constraint on travel to support new programmatic requirements, and increasing launch rate. The decrease in 1986 reflects a reduction due to the President's Management Improvement Initiative.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>III. OPERATION OF INSTALLATION.....</b>	<b><u>82,327</u></b>	<b><u>88,024</u></b>	<b><u>87,092</u></b>	<b><u>96,518</u></b>
<u>Summary of Fund Requirements</u>				
A. Facilities Services.....	49,246	50,464	50,323	58,583
B. Technical Services.....	8,506	8,784	8,784	10,683
C. Management and Operations.....	<u>24,575</u>	<u>28,776</u>	<u>27,985</u>	<u>27,252</u>
Total, Operation of Installation.....	<u>82,327</u>	<u>88,024</u>	<u>87,092</u>	<u>96,518</u>

Explanation of Fund Requirement

Operation of Installation provides a broad range of services, supplies, and equipment in support of the Center's institutional activities. These are divided into three major functional areas: Facilities Services, the cost of renting real property, maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; Technical Services, the cost of automatic data processing for management activities, and the cost of educational and informational programs and technical shops supporting institutional activities; and Management and Operations, the cost of administrative communications, printing, transportation, medical, supply, and related services.

The increase in Facilities Services from the 1985 budget estimate to the 1985 current estimate is due to rate and consumption increases in the purchased utilities function. The 1986 increase is due to anticipated rates of the Florida Power & Light which shifts more of the system costs to industrial consumers and to anticipated price levels for support contractor effort and other goods and services needed to support the KSC program fully. These increases will be partially offset by a reduction in the Management and Operations subcategory as part of the President's Management Improvement initiative.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. <u>FACILITIES SERVICES</u> .....	<u>49,246</u>	<u>50,464</u>	<u>50,323</u>	<u>58,583</u>

Summary of Fund Requirements

1. <u>Rental of Real Property</u> , .....	40	22	13	12
2. <u>Maintenance and Related Services</u> .....	5,312	6,029	5,747	6,233
3. <u>Custodial Services</u> .....	21,321	22,464	20,366	23,892
4. <u>Utility Services</u> .....	<u>22,573</u>	<u>21,949</u>	<u>24,197</u>	<u>28,446</u>
Total, Facilities Services.....	<u>49,246</u>	<u>50,464</u>	<u>50,323</u>	<u>58,583</u>

Explanation of Fund Requirements

1. <u>Rental of Real Property</u> .....	<u>40</u>	<u>22</u>	<u>13</u>	<u>12</u>
---	-----------	-----------	-----------	-----------

This provides for the rental of off-site facilities for news and other media centers for NASA launches. The reduction from the 1984 and the 1985 and 1986 estimates is due to lower rental space requirements.

2. <u>Maintenance and Related Services</u> .....	<u>5,312</u>	<u>6,029</u>	<u>5,747</u>	<u>6,233</u>
--	--------------	--------------	--------------	--------------

This activity involves the operation, maintenance, and engineering of institutional facilities, systems, and equipment. It includes ground maintenance, maintenance and repair of all heavy equipment, operation and maintenance at Vandenberg Air Force Base, and the general management and supervision of the operations and maintenance of the power, lighting, HVAC, water and sewer systems. These funds also provide materials and equipment needed to support these functional needs.

The reduction from the 1985 budget estimate to the 1985 current estimate is because of lower contractor wage rates than anticipated and non-approval of the operational maintenance initiative. The increase in 1986 reflects anticipated support service contractor rates.

	1984	1985		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Custodial Services</u> .....	<u>21,321</u>	<u>22,464</u>	<u>20,366</u>	<u>23,892</u>

This category includes janitorial services, fire protection, and security. Funding provides janitorial services to highly specialized clean room areas and orbiter support equipment; conducting fire drills and fire inspections of facilities and equipment and fighting fires. Security protection of personnel and property involves: support of hazardous tests and operations; badging of all on-site personnel and official visitors; safeguarding flight hardware and other items of high intrinsic value; protection classified information; and maintaining area surveillance and traffic control. Other activities in this category consist of pest control services, laundry services, and supplies and equipment used by the support contractor performing the function. The decrease from the 1985 budget estimate to the 1985 current estimate is for contractor wage rates not as high as anticipated. The increase in 1986 is contractor rate increases and manpower increases to support additional facilities.

4. <u>Utility Services</u> .....	<u>22,573</u>	<u>21,949</u>	<u>24,197</u>	<u>28,446</u>
----------------------------------	---------------	---------------	---------------	---------------

The major utility is electrical energy purchased from Florida Power and Light Company through an Air Force contract. Fuel oil is purchased from a local supplier. Steam service is provided by the Air Force. Water services are purchased from the City of Cocoa and sewage treatment is accomplished on-site. Utility plant operations and maintenance and utility distribution systems maintenance are provided by a support contractor and by the Air Force. At the Vandenberg Air Force Base, utilities are purchased through the Air Force. The increase from the 1985 budget estimate to the 1985 current estimate is due to utility rates and consumption. The 1986 increase provides for greater rates being charged industrial customers by the Florida Power and Light Company for projected utility usage, and for support contractor rate increases.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of	<u>Current</u> <u>Estimate</u> Dollars)	<u>Budget</u> <u>Estimate</u>
<b>B. <u>TECHNICAL SERVICES</u>.....</b>	<b><u>8,506</u></b>	<b><u>8,784</u></b>	<b><u>8,784</u></b>	<b><u>10,683</u></b>

Summary of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>7,023</u>	<u>7,040</u>	<u>7,040</u>	<u>8,645</u>
a. <u>Equipment</u> .....	(308)	(700)	(702)	(458)
b. <u>Operations</u> .....	(6,715)	(6,340)	(6,338)	(8,187)
2. <u>Scientific and Technical Information</u> .....	<u>803</u>	<u>1,077</u>	<u>1,077</u>	<u>1,220</u>
a. <u>Library</u> .....	(620)	(682)	(682)	(690)
b. <u>Education and information</u> .....	(183)	(395)	(395)	(530)
3. <u>Shop and Support Services</u> .....	<u>680</u>	<u>667</u>	<u>667</u>	<u>818</u>
Total, Technical Services.....	<u><u>8,506</u></u>	<u><u>8,784</u></u>	<u><u>8,784</u></u>	<u><u>10,683</u></u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>7,023</u>	<u>7,040</u>	<u>7,040</u>	<u>8,645</u>
---	--------------	--------------	--------------	--------------

The Base Operations contractor provides programming services for payroll, general accounting, supply, procurement, preventive maintenance, contract surveillance, personnel, security, resources and financial management reports and related management information. The contractor also provides for the development and maintenance of general management ADP programs which include the lease, purchase, and maintenance of ADP equipment, and programming and operations services. The increase in operations is to compete for highly qualified personnel to reduce the high turnover rate of data processing personnel currently experienced. The 1986 increase is due to anticipated contractor rate increases.

2. <u>Scientific and Technical Information</u> .....	<u>803</u>	<u>1,077</u>	<u>1,077</u>	<u><del>1,220</del></u>
--	------------	--------------	--------------	-------------------------

This funding provides for operation of a technical library at KSC and for technical and administrative documentation services, including support to the public affairs educational and information program.

The Base Operations contractor operates the library facilities, which provide technical and management books and periodicals; and military, federal, and professional society specifications and standards. The



contractor also operates a STS and Spacelab documents repository which catalogs, classifies, and indexes documents; and provides document reference and distribution services. Public Affairs support provides for the gathering and dissemination of information about the agency's program to the mass communications media, the general public, and the educational community at the elementary and secondary levels. The increase from the 1985 budget estimate to the 1986 estimate based on anticipated support contractor rates.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Shop and Support Services</u> .....	<u>680</u>	<u>667</u>	<u>667</u>	<u>818</u>

These funds provide for the Eastern Space and Missile Center photographic services for NASA's Public Affairs Office and any other institutional support. These funds also provide for the institutional part of the mishap reporting system. The 1986 increase is for anticipated Eastern Space and Missile Center rate increases.

	1984	1985		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. <u>MANAGEMENT AND OPERATIONS.....</u>	<u>24,575</u>	<u>28,776</u>	<u>27,985</u>	<u>27,252</u>

Summary of Fund Requirements

1. <u>Administrative Communications.....</u>	2,354	2,385	2,994	2,979
2. <u>Printing and Reproduction.....</u>	1,552	1,091	978	1,017
3. <u>Transportation.....</u>	4,770	5,050	5,310	5,507
4. <u>Installation Common Services.....</u>	<u>15,899</u>	<u>20,250</u>	<u>18,703</u>	<u>17,749</u>
Total, Management and Operations.....	<u>24,575</u>	<u>28,776</u>	<u>27,985</u>	<u>27,252</u>

Explanation of Fund Requirements

1. <u>Administrative Communications.....</u>	<u>2,354</u>	<u>2,385</u>	<u>2,994</u>	<u>2,979</u>
--	--------------	--------------	--------------	--------------

These funds provide for the costs of local telephone service, Federal Telecommunications System (FTS), long distance tolls, and special communication services in support of all NASA civil service and institutional contractor personnel located at KSC, ESMC, and VAFB. NASA contractors and other institutions who conduct official business with KSC are widely dispersed throughout the United States. KSC utilizes FTS and other leased lines to minimize costs. Special services include teletype, wire news services and lease and maintenance of various small electrical/electronic systems such as printers which support major communications systems. The Base Operations contractor will perform liaison activities for administrative communications systems and equipment which are installed and maintained by others and used by various contractor and government organizations at KSC and ESMC. The contractor also is responsible for performing operation and maintenance activities for other administrative communications systems and equipment and for operation of communications centers at KSC and ESMC. The decrease in the 1986 budget reflects the Governmentwide reduction in support costs.

	<u>1984</u>	<u>1985</u>		<u>1986</u>
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
2. <u>Printing and Reproduction</u> .....	<u>1,552</u>	<u>1,091</u>	<u>978</u>	<u>1,017</u>

This category includes printing services which are performed by the Government Printing Office (GPO) and minor commercial firms contracted by GPO. These items include KSC reproduction, the house organ, the telephone directory, and Public Affairs brochures and miscellaneous launch support material. Also included are printing and copier services at VAFB. The decrease from the **1985** budget estimate to the **1985** current estimate is due to reduced requirements for government printed paper and forms. The increase in **1986** is due to anticipated rate increases.

3. <u>Transportation</u> .....	<u>4,770</u>	<u>5,050</u>	<u>5,310</u>	<u>5,507</u>
--------------------------------	--------------	--------------	--------------	--------------

Funding covers the transportation management function, performed by the Base Operations contractor, which includes coordination, check, inspection, and document control of all shipments, delivery of in-bound shipments, and the operation of heavy transportation equipment. The maintenance of KSC's administrative aircraft is also included, as well as the cost of passenger and cargo type vehicles used by civil service personnel, and supplies, materials, and equipment used by the support contractor performing the function.

The increase from the **1985** budget estimate to the **1985** current estimate is for heavy equipment operations. The increase in **1986** is anticipated support contractor and vehicle maintenance rate increases.

4. <u>Installation Common Services</u> .....	<u>15,899</u>	<u>20,250</u>	<u>18,703</u>	<u>17,749</u>
--	---------------	---------------	---------------	---------------

These funds provide for management and logistics services, mail and distribution services, medical services, and a wide variety of minor contracts for special and one-time services. The Base Operations contractor provides management for the following areas: procurement, resources, maintenance, logistics, energy, data and information, staffing and training, planning and scheduling, and safety. This includes the estimating, planning, budgeting, authorizing, controlling, accumulating, and reporting of all costs and manpower associated with contract activities; and the necessary management, supervisory, engineering, technical, and administrative personnel required to plan, initiate, and perform the services and operations. Includes the establishment and management of a comprehensive safety program. The development of both short and long-range work plans, emergency plans and schedules in support of **KSC** base operations. Includes the development and implementation of a maintenance program for all institutional government furnished and contractor acquired systems, facilities and equipment. Also, the contractor will implement and manage energy conservation projects, programs, audits, and inspections on institutional facilities to insure conformance of energy conservation policy and to identify new energy initiatives in such areas as modifications, operational changes, energy studies and awareness. The Base Operations contractor, also,

provides a broad range of logistics services including receipt, storage, and issue of supplies and equipment, as well as maintaining various supply management systems. Mail and distribution services, provided by the support contractor include distribution of interoffice mail, classified document control, operation of the KSC branch post office, and postal service charges.

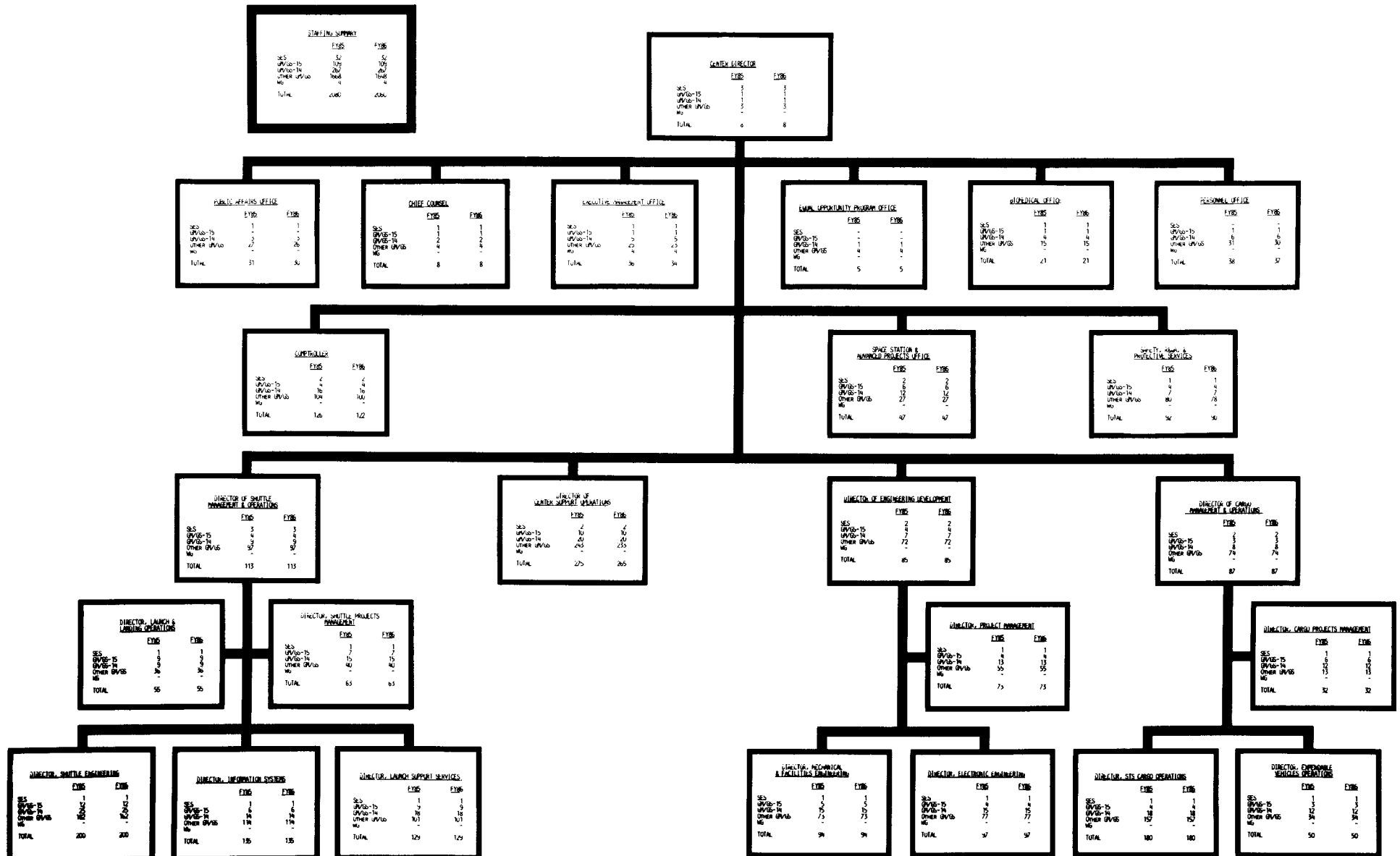
Two major types of medical services are provided, occupational medicine and environmental health. Occupational medicine includes emergency and first aid care for the workforce, guests, and tour visitors; health maintenance and counseling for civil service employees; and a variety of physical examinations and special programs for health maintenance, applied research, and job certification for civil service and contractor personnel. The contractor has been charged with ensuring compliance with Occupational Safety and Health Administration standards. The medical program operates on a three-shift basis to provide emergency and ambulance services and special standby service in support of launch operations including hazardous tests and operations. Environmental health consists of industrial hygiene, radiological health, and environmental sanitation program elements. This includes: monitoring hypergolic substances and other toxins; the maintenance of a centerwide toxic substances inventory; surveillance of the potable water supply and distribution; sewage management, sewage treatment and disposal; treatment and disposal of industrial wastes, solid wastes management and disposal; selection and use of pesticides; and the surveillance of sanitation practices in all food services areas.

This category also covers lease, maintenance, and purchase of administrative equipment. Rentals are primarily for special purpose office equipment more economical to lease than purchase. Maintenance is provided for all government-owned administrative equipment in active service. Purchases are largely replacements of office machines such as typewriters and calculators. Office supplies and equipment are provided to all civil service and institutional contractor personnel.

Tort claims, notary public fees, court reporting costs, patent counsel representation, and support costs associated with equal job opportunity activities are also covered under this activity.

The decrease from the **1985** budget to the **1985** current estimate is due to reduced rates from the Base Operational Contractor, and decreased supplies, equipment, and administrative support for this function. The **1986** decrease reflects the Governmentwide reduction in support costs.

# NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER



MARSHALL  
SPACE FLIGHT  
CENTER

## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1986 ESTIMATES

#### GEORGE C. MARSHALL SPACE FLIGHT CENTER

##### DESCRIPTION

Operations at Marshall Space Flight Center (MSFC) are conducted at three primary locations:

The principal MSFC site is near Huntsville, Alabama, on Army property at the Redstone Arsenal. The Center occupies **1,841** acres under a non-revocable use permit from the Army. The Huntsville location is connected by deep water access to its component Michoud Assembly Facility via the Tennessee, Ohio, and Mississippi Rivers.

The Michoud Assembly Facility is located **15** miles east of New Orleans, Louisiana, where the External Tanks for the Space Shuttle are being produced, and where activities for other Federal agencies are conducted. The Michoud Facility occupies **832** acres and provides **3,634,344 gross** square feet of space, including the main assembly plant. The facility is located on the Gulf Intracoastal Waterway and has deep water access via the Mississippi River.

The Slidell Computer Complex, located at Slidell, Louisiana, **20** miles northeast of the Michoud Assembly Facility, occupies **14** acres and provides centralized computer services for MSFC, Michoud, other NASA Centers, and associated contractors, as well as other government agencies.

A number of individual facilities at MSFC and its component installations are unique within NASA, and the Nation. The combined capability of the science and engineering laboratories, special development facilities, and test facilities, provide a unique national resource for designing, developing, and testing large, complex space systems. The total capital investment of the Marshall Space Flight Center and its installations in Louisiana, including fixed assets in progress, and contractor-held facilities at various locations as of September 30, **1984** was **\$793,671,000**.

## CENTER ROLES AND MISSIONS

The Marshall Space Flight Center serves as one of NASA's primary centers for the design and development of Space Transportation Systems, orbital systems, scientific and applications payloads, and other systems for present and future space exploration. MSFC has the principal role within NASA for rocket propulsion systems. The Center also has a principal role for the design and development of manned vehicle systems; for Spacelab mission management and payload definition and development; for design and development of large, complex, and specialized automated spacecraft; and management of materials processing in space activities. MSFC has a primary role within NASA for the development and processing of space science and applications experiments. In addition, MSFC conducts a vigorous research and technology program and is involved in the study and definition of future programs, including significant roles contributing to the development of large, complex space structures, space propulsion systems, materials engineering, materials processing in space, power systems, guidance and control, fundamental electronics, and payload systems analysis and integration.

In addition to on-site activities at Huntsville, Alabama, MSFC manages the Michoud Assembly Facility at New Orleans and the Computer Complex at Slidell, Louisiana. Resident offices are maintained at other centers and in conjunction with major industrial sites in various locations throughout the nation, and in Europe for the Spacelab program. The principal and supporting roles are:

### PRINCIPAL

Propulsion Systems - design, develop and procure major propulsion-oriented systems and subsystems. Current focus is on Space Transportation Systems, including Space Shuttle Main Engine, Solid Rocket Booster, External Tank, Inertial Upper Stage in cooperation with the Air Force, monitoring of the Payload Assist Module commercially developed and produced by McDonnell Douglas, and also the Transfer Orbit Stage being commercially developed by Orbital Sciences Corp. Advanced program efforts are focused on the definition of heavy lift, orbital transfer, orbital maneuvering, and unmanned launch vehicles, and propulsion technology for future high performance propulsion systems.

Manned Space Vehicle Development - design, development, and procurement of manned vehicle systems as assigned.

- Spacelab - focus is on program management, systems engineering, development of related payload carriers, program and engineering interface with European Space Agency, procurement, activation of the operational era system, and sustaining engineering.
- Advanced Development - technology advances focused on advanced missions.



Space Transportation System (STS) Sustaining Engineering - provide sustaining engineering for STS hardware and software to maintain a design which fulfills the original design intent throughout the life of the STS program, decrease the unit cost of manufacturing through design improvements, and upgrade operational performance capabilities through product improvement redesign.

Spacelab Payload Development and Mission Management - management of Spacelab 2, and 3 missions, ASTRO missions, Materials Science Lab missions, Earth Observations missions, and partial payload missions as assigned; and definition and development of payloads, facilities, experiments and instruments for space science and applications missions as assigned.

Specialized Automated Spacecraft - design, development, and procurement of large, complex and/or specialized automated spacecraft as assigned. Current focus is on assembly and verification of the Space Telescope, including science instrument integration and overall systems engineering. Other projects include the Tethered Satellite System in cooperation with Italy's National Research Council, and the Combined Release and Radiation Effects Satellite in cooperation with the U.S. Air Force. Studies are also being conducted on potential future missions such as the Advanced X-Ray Astrophysics Facility.

Space Station - management of space station definition studies for preliminary design and definition of the common module; logistics and laboratory module outfitting; and propulsion system and orbital maneuvering vehicle/orbital transfer vehicle accommodations.

Geostationary Platform Studies - identify and define concepts with associated attached payloads.

Space Processing - developing space processing discipline base, enlisting user interest in potential applications, and developing and managing space processing experiments.

#### SUPPORTING

Space Structures and Materials - contributing to the development of large, complex space structures and materials technology base.

Propulsion Technology - developing and evaluating alternate propulsion systems, techniques, and propellants for advanced launch systems and spacecraft.

## SUMMARY OF RESOURCES REQUIREMENTS

### Funding Plan By Function

		1985		1986
	1984 <u>Actual</u>	Budget <u>Estimate</u> (Thousands of Dollars)	Current <u>Estimate</u>	Budget <u>Estimate</u>
I. Personnel and Related Costs.....	144,107	144,451	148,862	144,783
11. Travel.....	4,479	4,211	4,939	5,300
III. Operation of Installation.....	41,266	46,602	43,775	45,722
A. Facilities Services.....	(19,363)	(23,214 )	(21,097)	(22,480)
B. Technical Services.....	(8,729)	(8,815)	(8,359)	(9,532)
C. Management and Operations.....	(13,174)	(14,573)	(14,319)	(13,710)
Total, fund requirements .....	<u>189,852</u>	<u>195,264</u>	<u>197,576</u>	<u>195,805</u>

Distribution of Permanent Workyears By Program

	1984 <u>Actual</u>	1985 <u>Budget Estimate</u>	<u>Current Estimate</u>	1986 <u>Budget Estimate</u>
<b><u>RESEARCH AND DEVELOPMENT</u>.....</b>	<b><u>1,789</u></b>	<b><u>1,845</u></b>	<b><u>1,892</u></b>	<b><u>2,118</u></b>
<u>Space Station</u> .....	<u>117</u>	<u>150</u>	<u>256</u>	<u>390</u>
<u>Space Transportation Capability Development</u> .....	<u>361</u>	<u>363</u>	<u>393</u>	<u>423</u>
<u>Space Science and Applications</u> .....	<u>1,176</u>	<u>1,145</u>	<u>1,079</u>	<u>1,138</u>
<u>Physics and Astronomy</u> .....	<u>922</u>	<u>926</u>	<u>868</u>	<u>915</u>
<u>Life Sciences</u> .....	<u>1</u>	<u>2</u>	<u>2</u>	<u>2</u>
<u>Space Applications</u> .....	<u>253</u>	<u>217</u>	<u>209</u>	<u>221</u>
<u>Commercial Programs</u> .....	<u>6</u>	<u>6</u>	<u>17</u>	<u>20</u>
<u>Technology Utilization</u> .....	<u>6</u>	<u>6</u>	<u>6</u>	<u>7</u>
<u>Commercial Use of Space</u> .....	<u>---</u>	<u>---</u>	<u>11</u>	<u>13</u>
<u>Aeronautics and Space Technology</u> .....	<u>129</u>	<u>181</u>	<u>147</u>	<u>147</u>
<u>Aeronautical</u> .....	<u>2</u>	<u>3</u>	<u>1</u>	<u>1</u>
<u>Space</u> .....	<u>127</u>	<u>178</u>	<u>146</u>	<u>146</u>
<b><u>SPACE FL        CONTROL AND DATA COMMUNICATIONS</u></b>	<b><u>964</u></b>	<b><u>885</u></b>	<b><u>849</u></b>	<b><u>622</u></b>
Shuttle Production and Operational Capability.....	430	363	453	339
Space Transportation Operations.....	534	522	396	283
Subtotal, Direct workyears.....	2,753	2,730	2,741	2,740
<b><u>CENTER MANAGEMENT AND OPERATIONS SUPPORT</u>.....</b>	<b><u>517</u></b>	<b><u>520</u></b>	<b><u>510</u></b>	<b><u>489</u></b>
Total, Full-Time Workyears.....	3,270	3,250	3,251	3,229
Other than Full-Time.....	<u>94</u>	<u>100</u>	<u>98</u>	<u>98</u>
Total, Workyears.....	<u>3,364</u>	<u>3,350</u>	<u>3,349</u>	<u>3,327</u>

## PROGRAM DESCRIPTION

Permanent Civil  
Service Workyears

### RESEARCH AND DEVELOPMENT

SPACE STATION..... 390

The 1986 activities include completion of the definition and preliminary design studies, configuration, selection, and definition of interfaces between the work packages. Advanced development, utilization, operational readiness, and systems engineering and integration (SE&I) activities will be continued.

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT..... 423

#### Spacelab

Activities include continuation of program management; completion of final deliveries on follow-on production hardware procured from the European Space Agency (ESA) consortium; integration of ESA and NASA provided hardware and software; completion of transition and transfer of Spacelab design engineering maintenance from Europe; and mission integration and preparation for three Spacelab flights, plus other missions involving Spacelab hardware (i.e., igloo, pallets, etc.). Also, the development of the capability to fly mixed cargoes will be completed with demonstration missions using Igloo Pallet, MDM Pallet, and Hitchhiker configurations.

#### Inertial Upper Stages (IUS)

Activities involve one IUS/TDRS mission which will require (1) a series of readiness reviews conducted to assure the flight readiness of the IUS prior to launch, (2) the conduct of joint integrated flight simulations prior to launch, (3) the launch and flight operations support, and (4) the post flight evaluation of the IUS performance.

#### Payload Assist Module (PAM)

Activities include monitoring the PAM-D and PAM-D-II, and PAM-A programs at McDonnell Douglas, the commercial development organization, to insure compatibility with the STS. Also included are expanding and improving the nozzle data base for use by the U.S. solid rocket motor industry.

Transfer Orbit Stage (TOS)

Activities include monitoring the TOS development and providing interface data to Orbital Science Corporation, the commercial development organization, to insure compatibility with the STS.

Tethered Satellite System

Activities include continued technical and programmatic management involving the U.S. deployer and instrument development, and overall systems engineering activities for the cooperation effort by the U.S. and Italy on the Tethered Satellite System. Specific activities in 1986 will include the Critical Design Review and delivery of the satellite engineering mode. Development of the selected science instruments for the first flight review will continue.

Advanced Programs

The Advanced Programs effort at MSFC includes the definition and implementation of in-house and contracted system studies to establish the fundamental planning and decision making data needed prior to proposing future space programs. Major 1986 advanced study activities include: (1) platforms and facilities in low-earth and geosynchronous orbit such as tethered satellite systems application and geostationary platform; (2) orbital services such as satellite servicing applications and in-orbit assembly, maintenance and repair; (3) advanced transportation including reusable evolutionary upper stages and shuttle derived launch vehicle systems; and (4) flight demonstrations such as the aeroassist flight experiment.

SPACE SCIENCE AND APPLICATIONS

Permanent Civil  
Service Workyears

PHYSICS AND ASTRONOMY..... 915

Hubble Space Telescope

The objective of the Hubble Space Telescope (HST) project is to launch a high quality optical 2.4-meter telescope system by the Space Shuttle for use by the astronomical community in conjunction with NASA. MSFC is the lead center for the management of the Hubble Space Telescope project and has overall implementation responsibility under the Office of Space Science and Applications for meeting cost, schedule, and technical performance of the project. MSFC is responsible for directing all NASA and contractor efforts, establishing, and maintaining effective project management activities, and for preparing and maintaining the detailed technical specifications which will define the requirements for all elements of the project. This includes technical assessment and evaluation of contracted activities for system engineering, design and development, assembly and verification, and maintenance and refurbishment. In 1986, the Hubble Space

Telescope integration and testing will be completed prior to final thermal vacuum and pre-ship functional testing leading to a launch in the second half of 1986. Critical Design Review of the Space Support Equipment will occur in 1986 in preparation for post-launch maintenance and refurbishment missions.

#### Gama Ray Observatory

The objective of the Gama Ray Observatory (GRO) mission is to measure gamma radiation from the universe, and to explore the fundamental physical processes powering it. MSFC has responsibility for the design and development of the Burst and Transient Source Experiment (BATSE) which is one of the four experiments being developed to obtain the GRO objectives. The Critical Design Review on the BATSE was accomplished in July 1984, and hardware fabrication and software development activities will be well underway in 1986.

#### Spacelab Payload Mission Management

In 1986, MSFC will be responsible for managing the ongoing activities of Spacelab 2 and 3 missions dedicated Earth Observation and Space Plasma Lab Missions; for several partial payload missions including three ASTRO missions; a group of Materials Science Lab missions; the Sunlab missions; and several Orbiter mid-deck payloads. MSFC is also responsible for in-house development of selected experiments and equipment to be flown on these missions.

Mission management responsibility begins with the definition of the payload complement and ends with the dissemination and analysis of the experiment data and materials resulting from the flight. During 1986, MSFC will continue to manage the assigned mission planning and definition activities, as well as development of the required instruments and supporting hardware/software. Spacelab 2 and 3 missions and Materials Science Lab-1 and 2 Missions are scheduled for launch in 1985, and EASE/ACCESS, EOM-1, MSL-4, ASTRO-1, AND SUNLAB-1 are scheduled for launch in 1986. Interfaces will continue to be maintained during 1986 with the appropriate NASA program offices, the Principal Investigators, and other appropriate groups to assure accomplishment of the scientific objectives of the missions. MSFC will continue to participate in and manage the analysis of the requirements, objectives, and constraints of the STS systems and payload complements in order to develop requirements for all levels of integration to insure physical, functional, and operational compatibility for all assigned missions.

#### Supporting Research and Technology

The OSSA supporting research and technology activities at MSFC are oriented to develop new technologies required for future science and applications missions. The principal science areas are Astrophysics and Solar Terrestrial. In 1986, definition efforts on the Advanced X-Ray Astronomical Facility and technology support leading to development activities in subsequent years will continue. The principal application area is in atmospheric research and materials science research, which support the definition efforts of future STS payloads.

LIFE SCIENCES..... 2

Efforts involves the investigation and development of concepts and technologies required to operate long duration life sciences experiments in space.

SPACE APPLICATIONS..... 221

Microgravity Science and Applications (MSA)

The Microgravity Science program emphasizes the fundamental science and technology of processing materials under conditions that allow detailed examination of the constraints imposed by gravitational forces. These studies are directed towards selected materials and processes which will best identify the limitations due to gravity, as well as demonstrate the enhanced control that may be possible by the weightless environment of space. In 1986, MSFC will continue to embody research and development activities in such area as: (1) crystal growth, (2) containerless processing, (3) fluid and chemical processing, and (4) solidification of metals and alloys. Continuing activities include ground based research, engineering and scientific analyses, advanced studies, definition, design, development, and operation of materials processing payloads.

Combined Release and Radiation Effects Satellite

1986 activities include the delivery of CRESS subsystem flight hardware, software development, and compatibility testing with Ball Aerospace Systems Division and the Air Force Satellite Control Facility. Ground operating procedures will be developed, and the ground support equipment fabrication will be completed. The flight subsystems equipment buildup of the spacecraft will be completed and performance tests will be performed.

Atmospheric Supporting Research

Theoretical, field, and laboratory experimental research will be conducted in the global weather, severe storms, and local weather areas. Efforts will be concentrated on improving understanding of severe storms, mesoscale and global scale weather systems, and in defining Shuttle missions to obtain data required to understand and predict this phenomena.

COMMERCIAL PROGRAMS

TECHNOLOGY UTILIZATION..... 7

This program transfers new knowledge and innovative technology resulting from NASA's R&D programs for application in industry, medicine, and other public sector areas. Civil service engineering and science personnel provide a source of technical skills necessary to accomplish technology transfer to the public sector.

COMMERCIAL USE OF SPACE..... 13

The objective of the Commercial Use of Space program is to increase private sector awareness of space opportunities and encourage increased industry investment and participation in high technology space-based research and development. This effort will establish an organizational focal point to initiate a program specifically intended to foster commercial use and access to space.

AERONAUTICAL RESEARCH AND TECHNOLOGY..... 1

Efforts in Aeronautics R&T are directed at developing a complete end-to-end high-speed mainframe computer networking subsystem. This subsystem will provide for sharing unique mainframe computational capabilities embodied in various large scientific computers located at NASA centers. Studies will be conducted on the application of infrared lasers for measuring atmospheric flow structure.

SPACE RESEARCH AND TECHNOLOGY..... 146

The Space Research and Technology activities are in materials and structures, space energy conversion, controls and human factors, space data and communications, chemical propulsion, and platform systems. The primary effort in 1986 will be on developing technology for future high performance propulsion systems and large space systems.

SPACE FLIGHT, CONTROL, AND DATA COMMUNICATIONS

SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY..... 339

This effort will provide main engines for a national fleet of four Space Shuttle Orbiters; provide sufficient ground support equipment, launch site equipment and support to launch operations; and to



Permanent Positions  
(Civil Service)

establish a logistics support capability to provision spares and repair/overhaul flight hardware. Plans are to continue with the development of additional Shuttle performance capability and the identification of improvements to make space transportation more economical.

SPACE TRANSPORTATION OPERATIONS..... 283

This activity provides the standard operational support services for the Space Shuttle in the Operations phase. Primary activities for 1986 will include the production, overhaul, and acquisition of hardware for operational flights. The flight hardware program element provides for the procurement of external tanks (ET), solid rocket motors, booster hardware, and propellants; spare components for the main engine; sustaining engineering and logistics support for external tanks, solid rocket boosters, and main engine flight hardware elements; and for the maintenance and operations of flight crew equipment. Typical functions will be production engineering, manufacturing, sustaining engineering, anomaly resolution, logistics configuration management, systems level analysis, test and integration tasks, ground operations, and contract management.

CENTER MANAGEMENT AND OPERATIONS SUPPORT..... 489

Center Management and Operations Support is provided to all MSFC organizations and includes the following:

Director and Staff - The Center Director, Deputy Director, and immediate staff, e.g., Comptroller, Legal, Patent Counsel, Equal Opportunity, Public Affairs, and Safety.

Management Support - Those who provide management and support services to all levels of Center management, both program and functional. Specific functions include resources and financial management, program control, contracting and procurement, property management, personnel management, and management systems and analysis.

Operations Support - Those who manage or provide for the operation and maintenance of institutional facilities, buildings, systems and equipment, including those who manage or provide technical services such as automatic data processing, reliability and quality assurance, medical care, and photographic support.

# RESOURCES REQUIREMENTS BY FUNCTION

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>144,107</u>	<u>144,451</u>	<u>148,862</u>	<u>144,783</u>
<u>Basis of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	124,795	123,515	128,062	123,464
b. Other than full time permanent positions	1,523	1,947	1,864	1,878
c. Overtime and other compensation.....	<u>1,323</u>	<u>1,312</u>	<u>1,673</u>	<u>1,919</u>
Subtotal, Compensation.....	127,641	126,774	131,599	127,261
2. <u>Benefits</u> .....	<u>15,664</u>	<u>16,547</u>	<u>16,097</u>	<u>16,222</u>
Subtotal, Compensation and Benefits....	<u>143,305</u>	<u>143,321</u>	<u>147,696</u>	<u>143,483</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	211	501	537	448
2. Personnel training.....	<u>591</u>	<u>629</u>	<u>629</u>	<u>852</u>
Subtotal, Supporting Costs.....	<u>802</u>	<u>1,130</u>	<u>1,166</u>	<u>1,300</u>
Total, Personnel and Related Costs.....	<u>144,107</u>	<u>144,451</u>	<u>148,862</u>	<u>144,783</u>

### Explanation of Fund Requirements

	1984	1985	1986
	<u>Actual</u>	<u>Budget Estimate</u> (Thousands of Dollars)	<u>Budget Estimate</u>
A. <u>Compensation and Benefits</u> .....	143,305	143,321	143,483
1. <u>Compensation</u> .....	127,641	126,774	127,261
a. <u>Permanent positions</u> .....	124,795	123,515	123,464

The increase from the 1985 budget estimate to the 1985 current estimate is due primarily to the January 1985 pay raise. The 1986 estimate reflects a reduction due to the President's Management Improvement Initiative and the proposed reduction in pay rates.

### Basis of Cost for Permanent Positions

In 1986 the cost of permanent positions will be \$123,464,000, a decrease of \$4,598,000 from 1985. This increase is calculated as follows:

Cost of full-time permanent workyears in 1985.....	128,062
Cost Increases in 1986.....	3,798
Within-grade and career advances.....	2,291
Full year cost of 1985 actions.....	1,106
Part year cost of 1986 actions.....	1,185
Full year cost of 1985 pay raise.....	1,076
Alteration in the method of calculating salaries paid.....	431
Cost Decreases in 1986.....	-8,396
Turnover savings and abolished positions.....	-1,557
Full year cost of 1985 actions.....	-365
Part year cost of 1986 actions.....	-1,192
1986 FTE reduction.....	-756
Proposed governmentwide salary reduction.....	-6,083
Cost of full-time permanent workyears in 1986.....	123,464

	1984	1985	1985	1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Non-permanent				
(1) Cost.....	1,523	1,947	1,864	1,878
(2) Man-years.....	131	153	151	151

The cost of non-permanent positions from 1985 to 1986 is essentially the same, with a slight increase due to full-year effect of January 1985.

c. Overtime and Other Compensation.....	1,323	1,312	1,673	1,919
---	-------	-------	-------	-------

The 1985 current estimate is higher than the 1985 budget estimates due to the January 1985 payraise. The 1986 increase reflects requirements related to planned programmatic activity.

2. <u>Benefits.....</u>	<u>15,664</u>	<u>16,547</u>	<u>16,097</u>	<u>16,222</u>
-------------------------	---------------	---------------	---------------	---------------

The distribution of these costs by major categories is as follows:

<u>Category of Cost</u>				
Contribution to the Civil Service				
Retirement Fund.....	8,711	8,897	8,793	8,578
Contribution for employee life insurance..	349	390	363	362
Contribution for employee health insurance	3,624	4,000	3,634	3,736
Contribution to FICA.....	57	297	301	504
Reemployed Annuitants.....	0	0	0	0
Severance pay.....	6	0	0	0
Unemployment Compensation.....	4	6	5	5
Workmen's Compensation.....	1,525	1,543	1,543	1,512
Medicare.....	1,388	1,414	1,458	1,525
Permanent Change of Station.....	---	---	---	---
 Total.....	 <u>15,664</u>	 <u>16,547</u>	 <u>16,097</u>	 <u>16,222</u>

The 1985 current estimate is lower than the 1985 budget estimate due to the lower than anticipated health insurance costs. The 1986 decrease is due to the proposed reduction in pay and the attendant benefits, as well as, the reduction in administrative workyears.

B. <u>Supporting Costs</u> .....	<u>802</u>	<u>1,130</u>	<u>1,166</u>	<u>1,300</u>
1. Transfer of personnel.....	211	501	537	448

The estimate cost provides for certain relocation costs, such as the expenses of selling and buying a home and the movement of household goods. The 1985 current and 1986 budget estimates reflect the costs associated with anticipated relocation costs.

2. Personnel training.....	591	629	629	852
----------------------------	-----	-----	-----	-----

The purpose of the MSFC training program is to continue the development of skills and knowledge of civil service employees in order to more efficiently support MSFC's roles and missions in the Space Program. The benefits to be derived by NASA, from the training and educational programs conducted at MSFC include: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency with the administrative and clerical work force; development of needed skills and knowledge required in MSFC mission activities; and extending MSFC work force capacity and increasing productivity. The 1986 estimate reflects planned levels of training.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>II. <u>TR</u></b>	<b><u>4,479</u></b>	<b><u>4,211</u></b>	<b><u>4,939</u></b>	<b><u>5,300</u></b>

Summary of Fund Requirements

A. Program Travel.....	3,975	3,574	4,222	4,611
B. Scientific and Technical Development Travel.....	62	240	240	250
C. Management and Operations Travel.....	<u>442</u>	<u>397</u>	<u>477</u>	<u>439</u>
TOTAL TRAVEL.....	<u>4,479</u>	<u>4,211</u>	<u>4,939</u>	<u>5,300</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>3,975</u>	<u>3,574</u>	<u>4,222</u>	<u>4,611</u>
--------------------------------	--------------	--------------	--------------	--------------

Program travel is directly related to the accomplishment of the Center's mission, and accounts for 87 percent of total travel. Travel requirements include those for ongoing programs such as the STS Operations, Spacelab, Space Station, Inertial Upper Stage, Space Telescope, Spacelab Payloads, Space Science and Applications payloads and basic supporting research and technology, as well as support to the planning and definition of potential new programs. The increase in 1986 is primarily due to new program activity and increased cost of travel.

B. <u>Scientific and Technical Development Travel</u> .....	<u>62</u>	<u>240</u>	<u>240</u>	<u>250</u>
---	-----------	------------	------------	------------

Scientific and technical related travel permits employees to participate in meetings and technical seminars with representatives of the aerospace community. This participation allows them to maintain technical excellence, as they benefit from exposure to technological advances outside MSFC, as well as to present both accomplishments and concerns to their associates. These meetings are principally working panels convened to solve problems for the benefit of the Government. The increase in 1986 will permit the same level of travel as in 1985.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Management and Operations Travel</u> .....	<u>442</u>	<u>397</u>	<u>477</u>	<u>439</u>

Management and Operations travel is required for the direction and coordination of general management matters. It includes travel by managers in such areas as personnel, financial management, and procurement activities and travel of the Center's top management to NASA Headquarters and other NASA Centers. This category of travel includes local travel, passenger vehicle rental and non-NASA travel. Local travel includes personal travel in and around the official station of the employee and includes tolls, parking fees and taxis. Passenger vehicle rental includes lease of commercial passenger vehicles. The current "fixed price" four year commercial vehicle rental contract that MSFC has signed with MSI extends through July 1986. Non-NASA travel includes transportation of persons, per diem, and other incidental expenses for all non-NASA employees, such as unpaid members of research advisory committees and pre-employment interviews for NASA SES positions. The increase from the 1985 budget estimate to the 1985 current estimate reflects increased management activity related to the development of new programs plus the increased cost of travel. The decrease in 1986 reflects the reduction related to the President's Management Improvement Initiative.

	1984	1985		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>III. <u>OPERATION OF INSTALLATION</u>.....</b>	<b><u>41,266</u></b>	<b><u>46,602</u></b>	<b><u>43,775</u></b>	<b><u>45,722</u></b>

Summary of Fund Requirements

A. Facilities Services.....	19,363	23,214	21,097	22,480
B. Technical Services.....	8,729	8,815	8,359	9,532
C. Management and Operations.....	<u>13,174</u>	<u>14,573</u>	<u>14,319</u>	<u>13,710</u>
Total, Operation of Installation.....	<u>41,266</u>	<u>46,602</u>	<u>43,775</u>	<u>45,722</u>

Explanation of Fund Requirements

Operation of Installation provides a broad range of services, supplies, and equipment in support of the Center's institutional activities. These are divided into three major functional areas: Facilities Services, the cost of maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; Technical Services, the cost of automatic data processing for management activities, and the cost of educational and informational programs and technical shops supporting institutional activities; and Management and Operations, the cost of administrative communications, printing, transportation, medical, supply, and related services.

The decrease reflected in the 1985 current estimate from the budget estimate is based primarily on the non-approval of the MSFC portion of the NASA-wide Operational Maintenance Augmentation, deletion of automatic data processing equipment and less than anticipated rate increases in Utilities. The 1986 budget estimate provides for anticipated utility rates, at the planned level of usage, contractor wage rates and price levels for other required goods and services, partially offset by the effect of the President's Management Improvement Initiative.



	1984	1985	1986
	<u>Actual</u>	<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> <u>Budget Estimate</u>
A. <u>FACILITIES SERVICES</u> .....	<u>19,363</u>	<u>23,214</u>	<u>21,097</u> <u>22,480</u>

The Marshall Space Flight Center (MSFC) occupies 1,841 acres under a Department of the Army non-revocable lease in a complex of science and engineering laboratories and special development and test facilities. The complex encompasses 3,800,000 gross square feet of building space. This physical plant houses an average daily on-Center population of approximately 4,900 personnel.

Summary of Fund Requirements

1. <u>Maintenance and Related Services</u> .....	<u>5,548</u>	<u>7,299</u>	<u>6,342</u>	<u>6,988</u>
a. <u>Facilities</u> .....	4,904	6,593	5,452	6,074
b. <u>Equipment</u> .....	644	706	890	914
2. <u>Custodial Services</u> .....	<u>4,349</u>	<u>4,439</u>	<u>4,390</u>	<u>4,492</u>
3. <u>Utility Services</u> .....	<u>9,466</u>	<u>11,476</u>	<u>10,365</u>	<u>11,000</u>
Total, Facilities Services .....	<u>19,363</u>	<u>23,214</u>	<u>21,097</u>	<u>22,480</u>

Explanation of Fund Requirements

1. <u>Maintenance and Related Services</u> .....	<u>5,548</u>	<u>7,299</u>	<u>6,342</u>	<u>6,988</u>
--	--------------	--------------	--------------	--------------

This activity involves maintenance and operation of a total of 204 facilities (building, structures, and trailers). The 1985 current estimate reflects a decrease due to the non-approval of the Operations Maintenance Augmentation. The increase from 1985 to 1986 reflects anticipated price levels.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of	Dollars)	
2. <u>Custodial Services</u> .....	<u>4,349</u>	<u>4,439</u>	<u>4,390</u>	<u>4,492</u>

Custodial services include janitorial services, security services, fire protection, trash removal, sanitary landfill operations, and related supplies and materials. Janitorial service is provided to about 3 million square feet of facility space and trash removal for approximately 115 separate locations. Security and fire protection services include 24-hour coverage of MSFC property, law enforcement, and motor vehicle registration and control. The decrease from the 1985 budget to the 1985 current estimate is due to expected decreases in Red Stone Arsenal Support Activity (RASA) rates for fire protection and sanitary landfill. The increase from 1985 to 1986 is escalation based on anticipated price levels.

3. <u>Utility Services</u> .....	<u>9,466</u>	<u>11,476</u>	<u>10,365</u>	<u>11,000</u>
----------------------------------	--------------	---------------	---------------	---------------

This function provides for the cost of electricity, steam, natural gas, water, and sewage disposal service provided by RASA on a reimbursable basis. It also provides for the propane and burner fuel to generate steam for heating and cooling. The decrease from the 1985 budget estimate to the 1985 current estimate reflects the 1984 rate experience plus lower projected RASA rates. The increase in 1986 is due to anticipated rates at the planned usage level.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of	<u>Current</u> <u>Estimate</u> Dollars)	<u>Budget</u> <u>Estimate</u>
B. <u>TECHNICAL SERVICES</u> .....	<u>8,729</u>	<u>8,815</u>	<u>8,359</u>	<u>9,532</u>

Summary of Fund Requirements

1. <u>Automated Data Processing</u> .....	<u>5,814</u>	<u>5,694</u>	<u>5,389</u>	<u>6,290</u>
a. <u>Equipment</u> .....	1,690	1,456	1,151	1,601
b. <u>Operations</u> .....	4,124	4,238	4,238	4,689
2. <u>Scientific and Technical Information</u> .....	<u>1,202</u>	<u>1,232</u>	<u>1,120</u>	<u>1,366</u>
a. <u>Library</u> .....	1,018	1,085	930	1,168
b. <u>Education and information</u> .....	184	147	190	198
3. <u>Shop Support Services</u> .....	<u>1,713</u>	<u>1,889</u>	<u>1,850</u>	<u>1,876</u>
Total, Technical Services.....	<u>8,729</u>	<u>8,815</u>	<u>8,359</u>	<u>9,532</u>

Explanation of Fund Requirements

1. <u>Automated Data Processing</u> .....	<u>5,814</u>	<u>5,694</u>	<u>5,389</u>	<u>6,290</u>
---	--------------	--------------	--------------	--------------

Funds provide centralized systems analysis, programming, operations, and related computational services to meet the management and administrative computing requirements. This category also includes maintenance of ADP equipment such as central site computers and associated equipment. Equipment maintained includes IBM 4341, FR-80 microfiche system, systems software support, and a key-to-disc which collects, controls, organizes, and edits raw data for input into the IMB 4341.

This function also provides for the development and utilization of computer techniques and systems programming of all digital computers and associated equipment. Also included is associated auxilliary support equipment such as film processors, Xerox microfiche printers, Xerox forms copiers, punch card accounting machines, and Univac 4020 terminals. This activity includes the operations of two large magnetic tape libraries; receipt, control, and distribution of program and data processing products; and testing and cleaning of magnetic tapes.

The decrease from the 1985 budget estimate to the 1985 current estimate is due to delay in planned purchase of equipment and rates lower than anticipated. The increase from the 1985 current estimate to the 1986 budget estimate is due to hardware deferred from FY 1985 and computer support for administrative activities as part of the Center's goal of applying the latest technology to achieve maximum efficiency.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of	<u>Current</u> <u>Estimate</u> Dollars)	<u>Budget</u> <u>Estimate</u>
2. <u>Scientific and Technical Information.....</u>	<u>1,202</u>	<u>1,232</u>	<u>1,120</u>	<u>1,366</u>

This activity provides for the cost sharing operation of the Redstone Scientific Information Center (RSIC) library on Redstone Arsenal and other scientific and technical information services. Scientific information and library services are provided to MSFC employees and associated NASA contractor personnel through RSIC operations. The RSIC contains a central collection of books and journals, periodicals, documents on microfilm, and technical papers. Operation of the RSIC by the Army is under direction of a joint MSFC/Army Redstone scientific information board, with shared costs. These funds also provide for the preparation for reproducible pages for publication of NASA technical manuscripts and related documents and MSFC's share of the operation of the MSFC Visitor Information Center located at the Alabama Space and Rocket Center. The decrease in the 1985 budget estimate to the 1985 current estimate is due to the rate increases not being as high as anticipated. The 1986 increase is the result of higher costs to operate the MSFC visitors center and the Redstone Scientific Information Center.

3. <u>Shop and Support Service .....</u>	<u>1,713</u>	<u>1,889</u>	<u>1,850</u>	<u>1,876</u>
--	--------------	--------------	--------------	--------------

These funds provide the Center with support in the areas of graphics, photographic services, and related supplies, materials, and equipment. The decrease from the 1985 budget estimate to the 1985 current estimate reflects a lower negotiated contract cost than expected for essentially the same level of effort required in FY 1984. The increase in 1986 is due to escalation and the replenishment of depleted supplies and materials.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
C. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>13,174</u>	<u>14,573</u>	<u>14,319</u>	<u>13,710</u>

Summary of Fund Requirements

1. Administrative Communications.....	3,842	4,256	4,196	4,030
2. Printing and Reproduction.....	492	500	655	500
3. <del>Transportation</del> .....	3,249	4,144	3,811	3,585
4. Installation Common Services.....	<u>5,591</u>	<u>5,673</u>	<u>5,657</u>	<u>5,595</u>
Total, Management and Operations.....	<u>13,174</u>	<u>14,573</u>	<u>14,319</u>	<u>13,710</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>3,842</u>	<u>4,256</u>	<u>4,196</u>	<u>4,030</u>
---	--------------	--------------	--------------	--------------

Communications support for MSFC consists of local telephone service, long distance telephone service and various kinds of other non-telephone communications. The MSFC central exchange provides local telephone service. Long distance telephone service is provided by the GSA. Included are such items as long distance commercial tolls and the autodin network for ordering supplies and materials. In addition, these funds provide for the use of Weeden Mountain radio transmission facilities, support of the emergency warning system, and operations of MSFC's fire surveillance system. The decrease in the 1985 current estimate is based on 1984 actuals. The 1986 decrease reflects the Governmentwide reduction in support costs.

2. <u>Printing and Reproduction</u> .....	<u>492</u>	<u>500</u>	<u>655</u>	<u>500</u>
---	------------	------------	------------	------------

A portion of MSFC's printing and reproduction requirements are met by an on-site reproduction plant, MSFC purchases reproduction services from the Government Printing Office (GPO), the Army, and private firms. Purchased printing is an overflow requirement that cannot be handled within the on-site workload or capability. The increase from the 1985 budget to the 1985 current estimate reflects the full year effect of contracting-out a portion of this function. The 1986 decrease reflects the Governmentwide reduction in support costs.

	1984	1985		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Transportation</u> .....	<u>3,249</u>	<u>4,144</u>	<u>3,811</u>	<u>3,585</u>

Transportation includes operation and maintenance of vehicles and aircraft, transportation of related supplies and materials, and purchases of transportation equipment. Included is the maintenance of general purpose vehicles, material handling equipment, general special purpose trailers and vehicles, equipment such as cranes, tractors, generators and welders; and intermediate and major inspections. Freight charges for shipment of materials and equipment by both surface and air transportation are also included. The decrease from the 1985 budget estimate to the 1985 current estimate reflects less than anticipated increases in fuel rates. The decrease in 1986 is due to the Governmentwide reduction in support costs.

4. <u>Installation Common Services</u> .....	<u>5,591</u>	<u>5,673</u>	<u>5,657</u>	<u>5,595</u>
--	--------------	--------------	--------------	--------------

This activity provides administrative support to Center management and staff activities, medical services, and various other installation support services.

Center management and staff functions include patent counsel services, tort claims, and equal opportunity activities. Medical services provides occupational medicine and environmental health services for the maintenance and improvement of employee health at MSPC, with emphasis on prevention, diagnosis, treatment, and care of illnesses and injuries.

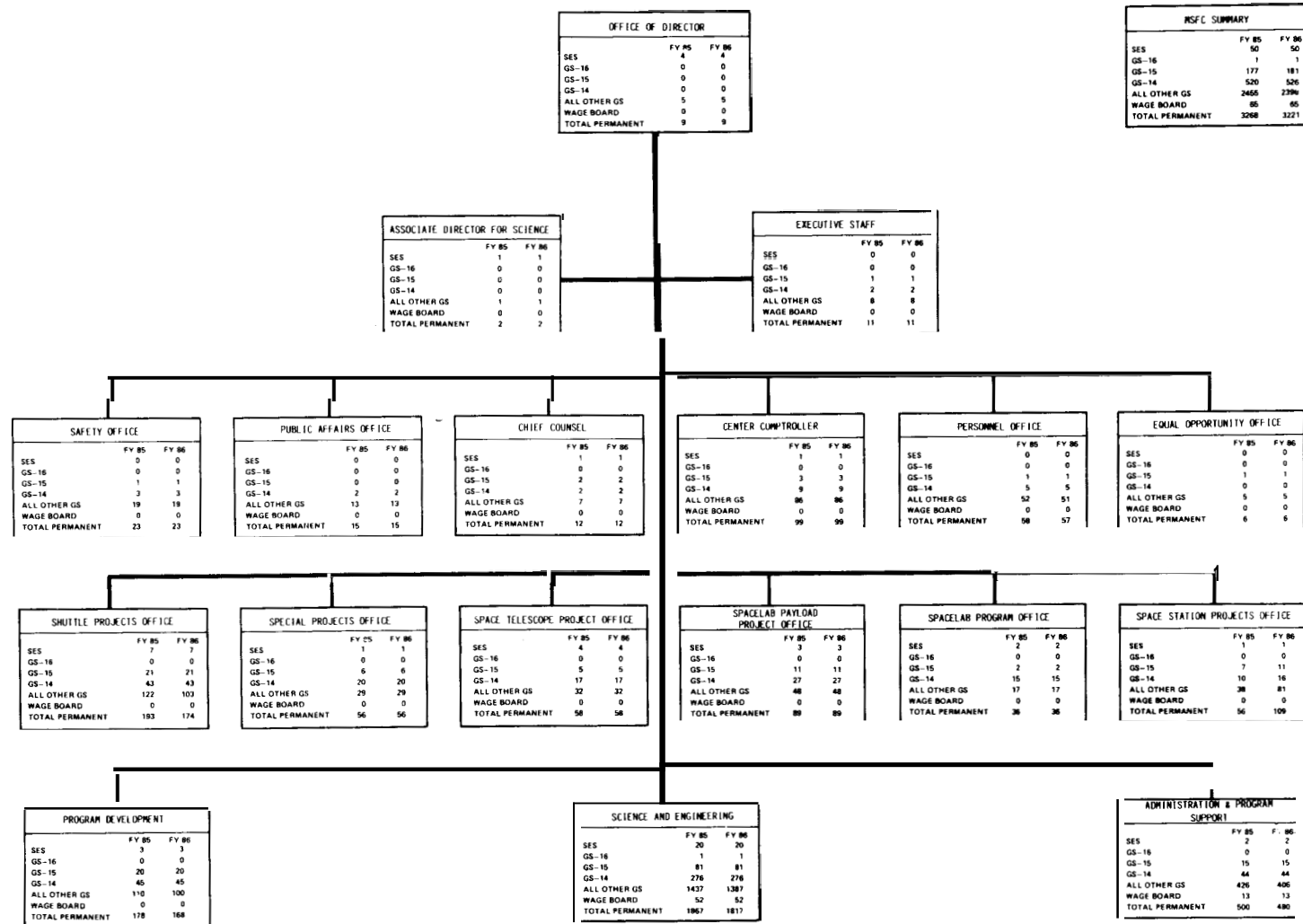
Installation support services include maintenance and repair of office equipment, equipment rental, acquisition of supplies and materials and other miscellaneous services such as: (1) receiving supplies, materials, and equipment; (2) distributing supplies, materials, equipment, and program-critical hardware; (3) preparing supplies, materials, and equipment for shipment, and (4) warehousing of raw materials.

Also provided are such services as the disposal of toxic waste, inspection of hazardous cargo prior to entry to Redstone Arsenal; receipt, storage, and issuance services for hazardous substances such as explosives, pyrotechnics and solid rocket motors; minor services such as laundry, furniture repair, toxic disposal, postage, and acquisition of supplies and materials.

The decrease in 1986 is a result of the Governmentwide reduction in support costs.

# NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

## GEORGE C. MARSHALL SPACE FLIGHT CENTER



NOTE: ALL MANPOWER SHOWN IN EOY  
11 26 84

RPM 3-25

NATIONAL SPACE  
TECHNOLOGY  
LABORATORIES





## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1986 ESTIMATES

#### NATIONAL CE TECHNOLOGY LABORATORIES

##### DESCRIPTION

The National Space Technology Laboratories is located in southwest Mississippi, approximately 50 miles northeast of New Orleans, Louisiana. The installation is situated on 138,807 acres and has deep water access via the Pearl River and the Intercoastal Waterway. Capital investment for the National Space Technology Laboratories, as of September 30, 1984, was \$315,356,000.

##### CENTER ROLES AND MISSIONS

The National Space Technology Laboratories (NSTL), formerly the Mississippi Test Facility, is NASA's prime static test facility for large liquid propellant rocket engines and propulsion systems. NSTL is presently engaged in development and acceptance testing of the Space Shuttle Main Engines and Main Propulsion System development testing. The center also conducts applied research and development in the fields of remote sensing, environmental sciences, and other selected applications programs. NSTL manages the installation and, through interagency agreements, provides support and maintains full utilization of all facilities by NASA and co-located elements of other executive agencies engaged in research, development, and operational activities. They include the Department of Defense, the Department of Interior, the Department of Commerce, the Environmental Protection Agency, the Department of Transportation, the State of Mississippi, and the State of Louisiana.

##### Principal Roles

Space Shuttle: - Provides, maintains and manages the facilities and the related capabilities required for the continued development and acceptance testing of the Space Shuttle Main Engines, and the development testing of the Shuttle's Main Propulsion Test Article which consists of a cluster of three main engines, an external tank and an orbiter aft-fuselage structure.

Space Applications: - Conducts fundamental and applied research, develops advanced airborne sensors and data/information systems, and conducts test and evaluation activities of remote sensing technology in the areas of renewable and nonrenewable resources.

Support to Tenant Agencies: - Provides technical and institutional support to resident agencies.

1 OF RESOURCES REQUIREMENTS

Funding Plan by Function

	1984	Budget	1985	1986
	<u>Actual</u>	<u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	4,717	4,735	5,014	4,879
11. Travel.....	182	170	180	200
111. Operation of Installation.....	5,295	6,000	5,746	6,052
A. Facilities Services.....	(2,589)	(3,853)	(3,039)	(3,473)
B. Technical Services.....	(745)	(181)	(619)	(674)
C. Management and Operations.....	(1,961)	(1,966)	(2,088)	(1,905)
Total, fund requirements.....	<u>10,194</u>	<u>10,905</u>	<u>10,940</u>	<u>11,131</u>

Distribution of Permanent Civil Service Workyears

	<u>1984</u>	<u>1985</u>	<u>1986</u>
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>
		<u>Budget</u>	<u>Estimate</u>
<u>RESEARCH AND DEVELOPMENT</u>			
<u>Direct Positions.....</u>	<u>46</u>	<u>46</u>	<u>43</u>
<u>Space Transportation System.....</u>	<u>7</u>	<u>5</u>	<u>7</u>
Space Transportation Capability Development.....	7	5	7
<u>Space Science and Applications .....</u>	<u>39</u>	<u>40</u>	<u>34</u>
Space Applications .....	39	40	34
<u>Commercial Programs.....</u>	<u>—</u>	<u>1</u>	<u>2</u>
Technology Utilization.....	1	---	---
Commercial Use of Space.....	---	---	2
Subtotal, Direct Workyears.....	46	46	43
<u>Center Management and Operations Support Positions</u>	<u>61</u>	<u>61</u>	<u>66</u>
Total, Permanent <b>Workyears</b> .....	<u>107</u>	<u>107</u>	<u>109</u>
Other Than Full Time Workyears.....	<u>18</u>	<u>13</u>	<u>18</u>
Total Workyears.....	<u>125</u>	<u>120</u>	<u>127</u>

## PROGRAM DESCRIPTION

Permanent Civil  
Service Workyears

### SPACE TRANSPORTATION CAPABILITY DEVELOPMENT..... 7

In 1986, the National Space Technology Laboratories will continue to provide, maintain, and manage the facilities and the related capabilities required for development and acceptance testing of the Space Shuttle Main Engines.

### SPACE APPLICATIONS..... 34

In 1986, the NSTL's Earth Resources Laboratory's program will continue to:

- Conduct research investigations in the application of remotely sensed data using existing aircraft and satellite programs as a basic source in conjunction with surface data to develop techniques and procedures for practical applications.
- Conduct applied research investigations for the application of new sensor data to priority information requirements of national concern in the areas of agricultural productivity, geological explorations, and land resources management including studies for aligning appropriate sensor technology with applicable disciplinary requirements.
- Promote the effective transfer of applications technology to reduce systems costs, and improve compatibility with other information sources and products.
- Conduct research and development applications in non-remote sensing applications primarily in areas such as environmental system development and closed ecosystems development.

### COMMERCIAL USE OF SPACE..... 2

The objective of the Commercial Use of Space program is to increase private sector awareness of space opportunities and encourage increased industry investment and participation in high technology space-based research and development. This effort will establish an organizational focal point to initiate a program specifically intended to foster commercial use and access to space.

CENTER MANAGEMENT AND OPERATIONS SUPPORT..... 63

Center Management and Operations Support is the support or services provided to organizations that cannot be identified exclusively to a single program or project. The civil service personnel involved are:

Director and Staff - The Installation Director, Deputy Director, and immediate staff, e.g., Legal, Equal Opportunity, and Public Affairs.

Management Support - Those who provide information and management services supporting all levels of Center management, both program and functional. Specific functions include resources and financial management, program control, contracting and procurement, property management, personnel management, and management systems and analysis.

Operations Support - Those who manage or provide for the operation and maintenance of institutional facilities, buildings, systems and equipment, including those who manage or provide technical services such as automatic data processing, reliability and quality assurance, medical care, and photographic support.

# RESOURCE REQUIREMENTS BY FUNCTION

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>4,717</u>	<u>4,735</u>	<u>5,014</u>	<u>4,879</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions .....	3,823	3,945	4,114	4,040
b. Other than full-time permanent positions	317	263	318	278
c. Overtime and other compensation.....	<u>5</u>	<u>18</u>	<u>16</u>	<u>16</u>
Subtotal, Compensation.....	4,145	4,226	4,448	4,334
2. <u>Benefits</u> .....	<u><del>454</del></u>	<u><del>469</del></u>	<u>471</u>	<u>460</u>
Subtotal, Compensation and Benefits.....	<u>4,599</u>	<u>4,695</u>	<u>4,919</u>	<u>4,794</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	92	20	70	60
2. Personnel training.....	<u>26</u>	<u>20</u>	<u>25</u>	<u>25</u>
Subtotal, Supporting Costs.....	<u>118</u>	<u><del>40</del></u>	<u>95</u>	<u><del>25</del></u>
Total, Personnel and Related Costs.....	<u>4,717</u>	<u>4,735</u>	<u>5,014</u>	<u>4,879</u>

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u> .....	4,599	4,695	4,919	4,794
1. <u>Compensation</u> .....	<del>4,145</del>	4,226	4,448	<del>4,334</del>
a. Permanent positions.....	3,854	3,945	4,114	4,040

The Current Estimate for 1985 reflects a change from the 1985 Budget Estimate due to the 1984 pay increase and nine months of the 1985 pay increase. The 1986 estimate reflects a reduction due to the application of the changes required by the President's Management Improvement Initiative and the proposed reduction in pay rates.

#### Basis of Cost for Permanent Positions

In 1986, the cost of permanent positions will be \$4,040,000, a decrease of \$74,000 from 1985. The decrease results from the following:

Cost of full-time permanent workyears in 1985.....	4,114
Cost Increases in 1986.....	262
Within-grade and career advances.....	213
Full year cost of 1985 actions.....	98
Part year cost of 1986 actions.....	115
Full year cost of 1985 pay raise.....	35
Alteration in the method of calculating salaries paid.....	14
Cost Decreases in 1986.....	-335
Turnover savings and abolished positions.....	-32
Full year cost of 1985 actions.....	-19
Part year cost of 1986 actions.....	-13
1986 FTE reduction.....	-108
Proposed governmentwide salary reduction... ..	-195
<b>Cost of full-time permanent workyears in 1986.....</b>	<b>4,040</b>

1984 <del>Actual</del>	<u>1985</u>		1986
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)			

B. Other than full-time permanent positions

1. <del>cost</del> .....	276	263	318	278
2. <del>workyears</del> .....	19	14	19	19

The distribution of 1986 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Developmental programs.....	3
Summer employment programs.....	1
Youth opportunity programs.....	1
Other temporary programs.....	<del>14</del>
Tal.....	19

The increase from the 1985 budget estimate to the 1985 current estimate is an increase in other than full time permanent employees. The 1986 level of effort is due to the proposed reduction in pay rates.

C. <u>Overtime and other compensation</u> .....	15	18	16	16
---	----	----	----	----

The increase from the 1985 current estimate to the 1985 current estimate meets management and administrative requirements in such areas as procurement and financial management. A level effort is maintained in FY 1986.



	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

2. <u>Benefits</u> .....	<u>454</u>	<u>469</u>	<u>471</u>	<u>460</u>
--------------------------	------------	------------	------------	------------

The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	283	283	293	286
Employee Life Insurance.....	11	11	11	11
Employee Health Insurance.....	107	121	112	109
FICA.....	7	11	7	<b>7</b>
Medicare.....	<u>46</u>	<u>43</u>	<u>48</u>	<u>47</u>
Total.....	<u>454</u>	<u>469</u>	<u>471</u>	<u>460</u>

The increase from the 1985 Budget Estimate to the 1985 Current Estimate results from the 1984 pay increase. The 1985 Current Estimate reflects partial year effect of 1985 pay increase. The decrease in 1986 is the full year effect of proposed salary decreases and reductions in personnel.

B. <u>Supporting Costs</u> .....	<u>118</u>	<u>40</u>	<u>95</u>	<u>85</u>
1. Transfer of <u>personnel</u> .....	92	20	70	60

The estimates for 1985 and 1986 are based on projected hiring plans.

2. Personnel <u>training</u> .....	26	20	25	25
------------------------------------	----	----	----	----

The personnel training program continues to develop the skills and knowledge employees in order to efficiently support center roles and missions.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
II. <u>TRAVEL</u> .....	<u>182</u>	<u>170</u>	<u>180</u>	<u>200</u>

Summary of Fund Requirements

A. Program Travel.....	77	102	81	105
B. Scientific and Technical Development Travel.....	4	4	5	5
C. Management and Operations Travel.....	<u>101</u>	<u>64</u>	<u>94</u>	<u>90</u>
Total, Travel.....	<u>182</u>	<u>170</u>	<u>180</u>	<u>200</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>77</u>	<u>102</u>	<u>81</u>	<u>105</u>
--------------------------------	-----------	------------	-----------	------------

Program travel requirements are directly related to the accomplishment of the Laboratories' mission, and will mainly be in support of Space Science and Applications Programs. Program travel will account for about 45 percent of total travel in 1985. The increase from the 1985 Budget Estimate to the 1985 Current Estimate reflects expected transportation cost increases.

B. Scientific and <u>Technical Development Travel</u> .....	<u>4</u>	<u>4</u>	<u>5</u>	<u>5</u>
---	----------	----------	----------	----------

Scientific and technical development travel will permit employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to retain their technical competency and gain awareness of technological advances outside NSTL as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government.

C. <u>Management and Operations Travel</u> .....	<u>101</u>	<u>64</u>	<u>94</u>	<u>90</u>
--	------------	-----------	-----------	-----------

Management and operations travel is used for the direction and coordination of general management matters. The increase from the 1985 Budget Estimate to the 1985 Current Estimate reflects 1984 experience. The increase in 1986 reflects anticipated travel needs.

	1984	1985		1986
	Actual	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<b>III. <u>OPERATION OF INSTALLATION</u>.....</b>	<b><u>5,295</u></b>	<b><u>6,000</u></b>	<b><u>5,746</u></b>	<b><u>6,052</u></b>

Summary of Fund Requirements

A. Facilities Services.....	2,589	3,853	3,039	3,473
B. Technical Services.....	745	181	619	674
C. Management and Operations.....	<del>1,961</del>	<del>1,966</del>	<u>2,088</u>	<u>1,905</u>
Total, Operation of Installation.....	<u>5,295</u>	<u>6,000</u>	<u>5,746</u>	<u>6,052</u>

~~Explanation of Fund Requirements~~

Operation of Installation provides a broad range of services, supplies, and equipment in support of the Center's institutional activities. Funding decrease from the 1985 Budget Estimate to the 1985 Current Estimate is due to the non-approval of the Operational Maintenance Initiative. The 1986 increase reflects the anticipated price levels, partially offset by the effect of the President's Management Improvement Initiative in the Management and Operations subcategory.

<b>A. <u>FACILITIES SERVICES</u>.....</b>	<b><u>2,589</u></b>	<b><u>3,853</u></b>	<b><u>3,039</u></b>	<b><u>3,473</u></b>
---	---------------------	---------------------	---------------------	---------------------

The NSTL is a complex of facilities comprised of laboratories, offices, and rocket engine test facilities and supports an average daily on-site population of 3,023. Many of the test facilities are utilized on schedules involving more than one shift operation and operations during off-peak hours.

		<u>1985</u>		<u>1986</u>
	<u>1984</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands	of Dollars)	
<u>Summary of Fund Requirements</u>				
1. <u>Rental of Real Property</u> .....	8	---	18	18
2. <u>Maintenance and Related Services</u> .....	<u>440</u>	<u>579</u>	<u>418</u>	<u>480</u>
a. Facility.....	193	430	382	440
b. Equipment .....	247	149	36	40
3. <u>Custodial Services</u> .....	267	429	325	344
4. <u>Utility Services</u> .....	<u>1,874</u>	<u>2,845</u>	<u>2,278</u>	<u>2,631</u>
Total, Facilities Services.....	<u>2,589</u>	<u>3,853</u>	<u>3,039</u>	<u>3,473</u>

1. <u>Rental of Real Property</u> .....	8	---	18	18
---	---	-----	----	----

Provides for lease of hanger space for the earth resources laboratory aircraft recently transferred to NSTL.

2. <u>Maintenance and Related Services</u> .....	<u>440</u>	<u>579</u>	<u>418</u>	<u>480</u>
--	------------	------------	------------	------------

This activity provides for the modifications and alterations of facilities and movements of personnel and equipment of the Earth Resources Laboratory (ERL) and equipment purchases for the ERL contractors. The 1986 funding is at the same level.

3. <u>Custodial Services</u> .....	<u>267</u>	<u>429</u>	<u>325</u>	<u>344</u>
------------------------------------	------------	------------	------------	------------

Provides for security guard services, janitorial services and fire protection services by the NSTL institutional support services contractor. The increase in the 1986 Budget Estimate reflects expected contractor cost rates.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
4. <u>Utility Services</u> .....	<u>1,874</u>	<u>2,845</u>	<u>2,278</u>	<u>2,631</u>

Provides for the purchase of the two utility commodities; electricity from the Mississippi Power Company and natural gas from the United Gas Pipe Line Company. Also provided is the operation of the utility distribution and control systems, water wells, and sewage systems. The increase in the 1986 Budget Estimate reflects expected utility rates.

B. <u>TECHNICAL SERVICES</u> .....	<u>745</u>	<u>181</u>	<u>619</u>	<u>674</u>
------------------------------------	------------	------------	------------	------------

Summary of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>55</u>	<u>5</u>	<u>5</u>	<u>5</u>
a. <u>Engineering</u> .....	<u>55</u>	<u>-</u>	<u>-</u>	
b. <u>Operation</u> .....	<u>-</u>	<u>5</u>	<u>5</u>	<u>5</u>
2. <u>Scientific and Technical Information</u> .....	<u>427</u>	<u>76</u>	<u>138</u>	<u>142</u>
a. <u>Library</u> .....	<u>2</u>	<u>4</u>	<u>4</u>	<u>4</u>
b. <u>Education and information</u> .....	<u>425</u>	<u>72</u>	<u>134</u>	<u>138</u>
3. <u>Shop and Support Services</u> .....	<u>263</u>	<u>100</u>	<u>476</u>	<u>527</u>
Total, Technical Services.....	<u>745</u>	<u>181</u>	<u>619</u>	<u>674</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>55</u>	<u>5</u>	<u>5</u>	<u>5</u>
Provides supplies and materials in support of the Center's ADP requirements.				
2. <u>Scientific and Technical Information</u> .....	<u>427</u>	<u>76</u>	<u>138</u>	<u>142</u>

Provides for books, periodicals, and other technical reports by the Earth Resources Laboratory, and NASA's share of upgrading and operating the NSTL Visitor Information Center.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Shop and Support Services</u> .....	<u>263</u>	<u>100</u>	<u>476</u>	<u>527</u>

Provides for technical services such as safety, photography and graphics and the purchase of O&M equipment and updated equipment to support the technical services. The increase in 1986 reflects expected contractor wages, rates and needed supplies and equipment.

	1984	1985		1986
	Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
C. MANAGEMENT AND OPERATIONS.....	<u>1,961</u>	<u>1,966</u>	<u>2,088</u>	<u>1,905</u>

Summary of Fund Requirements

1. Administrative Communications.....	891	919	1,043	861
2. Printing and Reproduction.....	4	54	41	43
3. Transportation.....	959	878	890	881
4. Installation Common Services.....	<u>107</u>	<u>115</u>	<u>114</u>	<u>120</u>
Total, Management and Operations.....	<u>1,961</u>	<u>1,966</u>	<u>2,088</u>	<u>1,905</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>891</u>	<u>919</u>	<u>1,043</u>	<u>861</u>
---	------------	------------	--------------	------------

Provides for local telephone service, FTS, long distance and operation and maintenance of the on-site communications equipment and switchboard. The increase from the 1985 Budget Estimate to the Current Estimate reflects cost escalation. The 1986 decrease reflects the impact of the President's Management Improvement Initiative.

2. <u>Printing and Reproduction</u> .....	<u>4</u>	<u>54</u>	<u>41</u>	<u>43</u>
---	----------	-----------	-----------	-----------

Provides for printing and reproduction services in support of the Earth Resources Laboratory and the local house organ. The decrease from the 1985 budget estimate to the 1986 current estimate reflects expected price levels.

3. <u>Transportation</u> .....	<u>959</u>	<u>878</u>	<u>890</u>	<u>881</u>
--------------------------------	------------	------------	------------	------------

Provides for local transportation for staff and support contractors, as well as freight costs, government bills of lading, air freight, other general shipments, and related transportation costs.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
4. <u>Installation Common Services.....</u>	<u>107</u>	<u>115</u>	<u>114</u>	<u>120</u>

Provides supplies, materials and equipment for the Earth Resources Laboratory. The decrease from the 1985 buget estimate to the 1986 current estimate reflects the same level of service.



# ORGANIZATION CHART

FY1986 CONGRESSIONAL BUDGET  
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
NATIONAL SPACE TECHNOLOGY LABORATORIES

NSTL SUMMARY STAFFING		
	FY85	FY86
SES	3	3
GM-15	6	6
GM-14	14	14
All other GSIGM	<u>86</u>	<u>83</u>
TOTAL PERMANENT	109	106

OFFICE OF THE MANAGER		
	FY85	FY86
SES	2	2
GM-14	1	1
All other GSIGM	<u>3</u>	<u>3</u>
TOTAL PERMANENT	6	6

CHIEF COUNSEL		
	FY85	FY86
GM-15	1	1
GM-14	1	1
TOTAL PERMANENT	<u>2</u>	<u>2</u>

EXECUTIVE STAFF		
	FY85	FY86
All other GSIGM	<u>4</u>	<u>4</u>
TOTAL PERMANENT	4	4

RESOURCES & FINANCIAL MANAGEMENT OFFICE		
	FY85	FY86
GM-14	1	1
All other GS/GM	<u>12</u>	<u>11</u>
TOTAL PERMANENT	13	12

PROCUREMENT & CONTRACTS OFFICE		
	FY85	FY86
GM-14	1	1
All other GS/GM	<u>9</u>	<u>8</u>
TOTAL PERMANENT	10	9

FACILITIES ENGINEERING OFFICE		
	FY85	FY86
GM-15	1	1
GM-14	2	2
All other GSIGM	<u>10</u>	<u>10</u>
TOTAL PERMANENT	13	13

INSTALLATIONS OPERATIONS OFFICE		
	FY85	FY86
GM-15	1	1
GM-14	3	3
All other GSIGM	<u>10</u>	<u>9</u>
TOTAL PERMANENT	14	13

EARTH RESOURCES LABORATORY		
	FY85	FY86
GM-15		
GM-14		
All other GS/GM	<u>38</u>	<u>38</u>
TOTAL PERMANENT	47	47

GODDARD  
SPACE FLIGHT  
CENTER

## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1986 ESTIMATES

#### GODDARD SPACE FLIGHT CENTER

##### DESCRIPTION

Goddard Space Flight Center (GSFC), located 15 miles northeast of Washington, D.C., at Greenbelt, Maryland, is situated on a 552-acre main site. Three additional nearby plots of 554 acres comprise the remote site area and contain the Goddard Antenna Test Range, the Goddard Optical Facility, the Propulsion Research Facility, the Laser Facility, the Magnetic Fields Component Test Facility, the Attitude Control Test Facility, and the Network Training and Test Facility. The Center also utilizes an additional 6,175 acres at the Wallops facility located on the Atlantic Coast of Virginia's eastern shore. The Wallops facility consists of 1,833 acres on the main base, 3,095 acres on Wallops Island launching site, 107 acres on the mainland tracking site, and 1,140 acres of marshland. The total capital investment for the GSFC, including tracking stations, contractor-held facilities at various locations, work in progress, and the Wallops facility, as of September 30, 1984, was approximately \$840,698,000.

The majority of the Goddard Center's personnel are located at Greenbelt, Maryland; other personnel are located at the Wallops facility in Virginia, the Goddard Institute for Space Studies in New York City, and throughout the world, managing the operation of satellite tracking and communications network stations.

##### CENTER ROLES AND MISSIONS

The GSFC, established in 1959 as the first major United States installation devoted to the investigation and exploration of space, conducts a wide-ranging program in space science and applications. The GSFC has developed many diverse capabilities: the management of complex projects; the development of wholly integrated spacecraft, ranging from systems engineering to development, integration, and testing; the development and operation of both the ground network of tracking and data acquisition facilities and the Tracking and Data Relay Satellite System; scientific research to include both theoretical studies and the development of many significant scientific experiments flown on satellites; and the operation of a research airport, located at Wallops, in support of NASA's aeronautics research programs. The principal and supporting roles are:

##### PRINCIPAL

EARTH ORBITAL SPACECRAFT DEVELOPMENT, ON-ORBIT SERVICING AND FLIGHT OPERATIONS - includes spacecraft propulsion and supporting technology such as low cost structural evaluation and reliability demonstration, advanced guidance systems and space power systems. Major emphasis is on automated, standard spacecraft

systems, free-flyers, experiment development and integration, on-orbit free-flyer and payload servicing, Space Station Platforms, and the planning and conducting of associated flight operations.

TRACKING AND DATA ACQUISITION SYSTEMS AND SUPPORT OPERATIONS - plans, develops, implements and operates tracking facilities and provides for the related data processing, communications, and mission control; plans and conducts support of Earth orbital spacecraft, aeronautical research and sounding rockets; and network planning and implementation support for Shuttle. (Tracking and data acquisition responsibilities include support of deep space as well as Earth orbital missions and the implementation of the Tracking and Data Relay Satellite System.)

LAUNCH RANGE AND RESEARCH AIRPORT MANAGEMENT AND OPERATIONS - plans and operates the Wallops launch range, associated aircraft, and a research airport in support of NASA aerospace programs as well as other Government agencies, such as the Department of Defense, and the academic and international community. Launch support and related services are provided for various sounding rockets and the expendable Scout launch vehicles launched at the Wallops facility.

EXPENDABLE LAUNCH VEHICLES - Goddard is the management center for the Delta launch vehicle, which will be used for NASA sponsored missions on a reimbursable basis.

SPACE SCIENCE AND APPLICATIONS - develops the science and technology discipline bases, develops and calibrates spaceborne sensors, ground data processing and analysis systems, conducts scientific research and theoretical modeling studies, and implements science and applications experiments in astronomy, solar physics, high energy, astrophysics, solar terrestrial studies, and atmospheric, oceanic, and land processes.

SOUNDING ROCKET DEVELOPMENT, PROCUREMENT AND OPERATIONS - develops and procures sounding rockets and carries out all phases of operations from mission/flight planning to landing and recovery, including supporting systems (i.e., guidance, telemetry and attitude control, power, payload housing, separation systems, and recovery).

BALLOON PROGRAM - manages and provides technical oversight and direction to the balloon activities conducted for both NASA and other agencies.

SPACELAB PAYLOAD DEVELOPMENT - develops, analytically integrates and processes data for Spacelab payloads in astrophysics, solar terrestrial physics, astronomy, and applications.

SPECIAL PAYLOADS ACTIVITIES - manages such Shuttle payload activities as sounding rocket class payloads which will be flown on the Space Shuttle (Spartans), Get-Away-Specials, and balloon projects. This involves development and operation of diverse mechanical, electrical, aerodynamic, propulsion, control, thermal, and combined systems.

## SUPPORTING

PLANETARY SCIENCE develops and applies techniques for the investigation and analysis of planetary atmospheres

AEROSPACE FLIGHT TEST SUPPORT - plans and conducts launches of scientific payloads and aeronautical tests and other research, development and related activities as requested by elements of NASA, the Department of Defense, other Government agencies, and the worldwide scientific community.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related <del>Costs</del> .....	150,285	154,955	157,626	153,815
II. <del>Travel</del> .....	3,739	3,935	4,058	4,314
III. Operation of <del>Installation</del> .....	32,749	40,400	37,798	41,590
A. Facilities <del>Services</del> .....	(17,568)	(21,939)	(20,504)	(24,192)
B. Technical Services....	(4,608)	(5,200)	(4,767)	(5,999 )
C. Management and <del>Operations</del> .....	<u>(10,573)</u>	<u>(13,261)</u>	<u>(12,527)</u>	<u>(11,399)</u>
Total, fund <del>requirements</del> .....	<u>186,773</u>	<u>199,290</u>	<u>199,482</u>	<u>199,719</u>

DISTRIBUTION OF CIVIL SERVICE WORKYEARS BY PROGRAM

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
<u>RESEARCH AND DEVELOPMENT</u> .....	<u>2. 184</u>	<u>2. 159</u>	<u>2. 209</u>	<u>2. 223</u>
<u>space Station</u> .....	25	50	80	113
<u>Space Transportation Capability Development</u> .....	19	0	20	13
<u>Space Science and Applications</u> .....	<u>1. 993</u>	<u>1. 936</u>	<u>1. 961</u>	<u>1. 950</u>
Physics and astronomy.....	1. 128	1. 047	1. 170	1. 150
Life sciences.....	2	1	1	1
Planetary exploration.....	76	81	77	77
Space Applications.....	787	807	713	722
<u>Commercial Programs</u> .....	11	10	13	14
Technology Utilization.....	11	10	10	10
Commercial Use of Space.....	---	---	3	4
<u>Aeronautics and Space Technology</u> .....	<u>111</u>	<u>134</u>	<u>104</u>	<u>105</u>
Aeronautical research and technology.....	15	19	13	13
Space research and technology.....	96	115	91	92
Space Tracking and Data Advanced Systems.....	25	29	31	28
<u>SPACE FLIGHT CONTROL AND DATA COMMUNICATIONS</u> .....	<u>745</u>	<u>733</u>	<u>702</u>	<u>687</u>
Space Transportation Operations.....	100	100	85	85
Space and Ground Network Communications and Data Systems.....	645	633	617	602
Subtotal. Direct Workyears.....	<u>2. 929</u>	<u>2. 892</u>	<u>2. 911</u>	<u>2. 910</u>
<u>CENTER MANAGEMENT AND OPERATIONS SUPPORT</u> .....	<u>679</u>	<u>707</u>	<u>688</u>	<u>659</u>
Subtotal Permanent Workyears.....	3. 608	3. 599	3. 599	3. 569
Other than full-time permanent.....	112	99	99	100
Total. permanent workyears.....	<u>3. 720</u>	<u>3. 698</u>	<u>3. 698</u>	<u>3. 669</u>

PROGRAM DESCRIPTION

Permanent Civil  
~~Service Workyears~~

SPACE STATION..... 113

Space Station activities involve evaluation of proposals and initial studies for definition of automated free-flying platforms, laboratory module outfitting and provisions to service, maintain and repair these platforms and free-flying spacecraft. In addition, system engineering and integration efforts will be performed in direct support of the Johnson Space Center. Discipline studies in thermal, propulsion, data systems, robotics and structure requirements will be conducted. Science working groups will be activated to involve potential users in space station requirements definition.

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT..... 13

GSFC is developing the Hitchhiker, a reusable carrier system which will provide increased flight opportunities with reduced leadtime, maximizing Shuttle load factors and minimizing spaceflight costs.

PHYSICS AND ASTRONOMY..... 1,150

Astrophysics activities at GSFC are pursued to accomplish laboratory and flight scientific research to increase human knowledge of the Earth's space environment, the stars, the Sun, and other objects in space; and provide advanced technical development of experiments and spacecraft components for future astrophysics missions. GSFC manages activities in the pursuit of scientific progress in all of the following discipline areas of astrophysics: gamma ray astronomy, X-ray astronomy, ultraviolet and optical astronomy, infrared and radio astronomy, particle astrophysics, solar physics, interplanetary physics, planetary magnetospheres, and astrochemistry.

During 1985 and 1986, GSFC investigators will be actively involved in various activities: verification and testing of instruments with the Hubble Space Telescope, Support System Module, and development, integration and testing of the ground system for the Hubble Space Telescope; continuing design and development activities on the Gamma Ray Observatory missions, the Cosmic Background Explorer, various Shuttle/Spacelab Payloads and integrated rocket experiments; and the analysis of data from several major Physics and Astronomy missions including the High Energy Astronomy Observatories, the Dynamics Explorer, the repaired Solar Maximum Mission and the Active Magnetospheric Particle Tracer Explorer.

The International Ultraviolet Explorer spacecraft, with its unique satellite control and data management system, will continue to afford guest observers the opportunity to point the satellite in real-time from the ground, make quick observations, and receive data in visual formats.



During 1985 and 1986, GSFC will be responsible for the continued development of a U.S. supplied focal plane high resolution imaging instrument to be flown on the German Roentgen Satellite which is scheduled for launch in 1987 on the Space Shuttle. The Roentgen Satellite, another NASA international cooperative project with the Federal Republic of Germany, will perform the first all sky surveys of X-ray sources and will point to and study specific X-ray sources for extended periods of time.

The development phase of the Solar Optical Telescope will be initiated in 1985, and will be continued during 1986. This facility will carry an instrument package to study solar physics in a detail never before possible by sensing radiation from the deep ultraviolet to the near infrared; thus enabling astronomers to study solar phenomena from the photosphere to the corona.

Goddard will provide the management and support of the NASA domestic and international sounding rocket programs. The project extends from conception through launch and analysis of the data obtained in the following areas: galactic astronomy, high energy astrophysics, solar physics, plasma physics, upper atmospheric and interdisciplinary research, and the space applications of materials processing science. During 1985 and 1986, Goddard will continue development of sounding rocket class payloads for flight on the Space Shuttle. This is a cost-effective approach which allows instruments to be flown for much longer periods of time than available with sounding rockets.

Goddard will also continue to manage the scientific balloon program providing launch and tracking support, flight hardware, and technical support including new systems development. Goddard has responsibility for operation of the National Scientific Balloon Facility at Palestine, Texas, and provides management and technical oversight.

Permanent Civil  
Service Workyears

LIFE SCIENCES..... 1

The Goddard Life Sciences activities involve the utilization of data from remote sensing satellites to increase our understanding of global biological characteristics and processes.

PLANETARY EXPLORATION..... 77

The GSFC activity within the Planetary Exploration program emphasizes the physics of interplanetary space environments. To this end, GSFC is maintaining a strong and viable research group.

The 1985 and 1986 program activities will span GSFC's broad roles and missions mandate, including activities in the discipline areas of land, oceans, and atmospheric sciences. GSFC is engaged in three major types of activities in these areas: research and technology, flight projects, and data analysis.

The research and technology effort is directed toward solving major problems in the disciplines mentioned and involves conceptual instrument design and testing, mission payload studies, and conceptual flight missions. This is accomplished through the design and construction of mathematical models to study:

1. The global circulation of the Earth's atmosphere for better weather and climate predictions;
2. The geopotential fields (gravity and magnetic) of the Earth to provide a better understanding of the structure and evolution of the Earth;
3. The processes of the oceans such as surface winds, waves, temperature, currents, and circulation in support of the ongoing weather and climate studies and the ocean research program;
4. The physical characteristics of the Earth's vegetation cover, water resources, and land use which can be remotely sensed; and
5. The interaction between the Earth's atmosphere, hydrosphere, and cryosphere.

Some examples of instrumentation activities which GSFC is supporting include instrumentation for measuring temperature and pressure profiles in the atmosphere which are essential parameters for weather and climate models; user active and passive microwave systems for measuring sea surface temperatures and winds, and measurement of soil moisture essential for water resources modeling and agricultural yield predictions; new instruments for ocean color measurements; and high precision laser electronic ranging systems in support of the Earth and ocean dynamics activities.

At GSFC flight project responsibilities in 1985 and 1986 include:

1. Operational weather satellite missions for the National Oceanic and Atmospheric Administration (NOAA), including launch of NOAA-G, in March 1985.
2. Continued operation of the Nimbus satellites to provide remotely sensed resources data and environmental observations to a worldwide applications research community.

3. The data from the Landsat-4 and 5 will continue to be analyzed to evaluate the benefits of a new generation of land observation instruments.
4. Earth Radiation Budget Experiment data will be collected for the study of geographical and seasonal variations of the Earth's radiation budget.
5. Conducting correlation measurements from balloons, sounding rockets, aircraft, and ground installations.
6. During FY 1986, design and development activities will be continued on the Upper Atmospheric Research Satellite instrument and the spacecraft, leading to a launch in 1989.

Earth Science activities involve the formulation, analysis, and distribution of data received from satellites for which GSFC has management responsibility. Such demonstrations involve the use of data from the Nimbus-7 spacecraft for the solution of problems concerning pollution, ocean resources and dynamics, and weather and climate. Similar activities will be conducted by using the data from Landsat-4; this information will be of use to investigators in the disciplines of agriculture, forestry, geology, land use, cartography, hydrology, ecology, and oceanography. Solar Terrestrial FY 1986 research efforts will include analysis of data collected from operating satellites, for example, the Dynamics Explorer, the Interplanetary Monitoring Probe and the International Sun-Earth Explorers which are providing opportunities to study the dynamic interactions of the solar wind and the Earth's magnetosphere from various points in space. The Interplanetary Cometary Explorer spacecraft will continue its unique trajectory on a course that will cause it to intercept the comet Giacobini-Zinner in September 1985.

#### TECHNOLOGY UTILIZATION.....

10

Technology Utilization activities are directed toward the application of space technology to public and private sector needs. Foremost among the technology applications projects in FY 1985 and FY 1986 are the cerebrospinal fluid control system and the closed loop system for hypertension. Other activities include: (1) new technology identification, evaluation, and publication; (2) dissemination methods and techniques; and (3) public sector technology applications projects.

#### COMMERCIAL USE OF SPACE.....

4

The objective of the Commercial Use of Space program is to increase private sector awareness of space opportunities and encourage increased industry investment and participation in high technology space-based research and development. This effort will establish an organizational focal point to initiate a program specifically intended to foster commercial use and access to space.

AERONAUTICAL RESEARCH AND TECHNOLOGY..... 13

In 1985 and 1986, the Wallops airport will be used to conduct research tests of various aircraft in the terminal area operating environment. Flight studies will be made of new approach and landing procedures utilizing the latest in guidance equipment and techniques, pilot information displays, terminal area navigation, and tests of other systems leading to automatic landing of aircraft.

One runway is being used to study means of controlling aircraft and automotive hydroplaning on wet or slush-covered surfaces. The data acquired from the aircraft and automotive tests will ultimately assist in the development of safer, more flexible transportation systems. Wallops will continue to support aircraft noise and safety research for general aviation.

SPACE RESEARCH AND TECHNOLOGY..... 92

The Space Research and Technology Program activities provide results appropriate to space missions. Past efforts have produced many worthwhile advances in space system capability, reliability, and effectiveness. During 1985 and 1986, program areas of primary emphasis will include sensor technology, data base systems and computer system science, and laser communications. Other discipline areas of continuing focus include materials and structures, thermal energy management, power systems, spacecraft systems automation science, and platform systems.

TRACKING AND DATA ADVANCED SYSTEMS..... 28

Goddard's activity in this area involves the investigation and development of advanced tracking and data acquisition systems techniques. The primary objectives are to: (1) obtain new and improved tracking and data capabilities that will meet the needs of approved new missions; and (2) improve the cost effectiveness and reliability needed for overall support of space flight missions.

SPACE FLIGHT CONTROL AND DATA     CAT :

SPACE TRANSPORTATION OPERATIONS..... 85

Space Shuttle activities at GSFC include planning and implementing the equipment systems, communications data, voice circuits, and operational procedures required for support of the Shuttle program.

Goddard manages and coordinates the Agency's Get-Away-Special Program. Center personnel coordinate with an international array of experimenters (including private citizens, high schools, universities and

industry) who have procured, through Agency established procedures, payload space on the Space Shuttle. Tasks include ensuring that experiments meet flight and safety specifications and securing the experiments into containers for Space Shuttle flight. Individual experimenters are responsible for the performance of their instruments/experiments.

Activities also include the management of a flight support system which is the electromechanical interface between the orbiter and multimission modular spacecraft and other spacecraft with compatible interface parameters. It will be used for ascent, retrieval, repair, and descent phases of Space Shuttle flights carrying Multimission Modular Spacecraft and other compatible spacecraft.

Goddard is the management center for the Delta expendable launch vehicle which is capable of accurately putting a wide variety of spacecraft into a broad spectrum of orbits, ranging from equatorial to polar inclinations. The Delta is used for a wide range of reimbursable missions for other Government agencies, domestic commercial users, and international users, currently with 43 consecutive successful launches. The Delta vehicle has served the Agency for nearly three decades and will be phased out in 1986 as a government-managed expendable vehicle program. A Scout launch capability is maintained by the Wallops facility

Permanent Civil  
Service Workyears

SPACE AND GROUND NETWORK COMMUNICATIONS AND DATA SYSTEMS..... 602

The Space Tracking and Data Systems program at GSFC involves five main areas: Operation of the Space Tracking and Data Network; mission control, data processing, and computation support for flight projects; the Laser Networks; the Tracking and Data Relay Satellite System; and aeronautics and sounding rocket support.

The Space Tracking and Data Network is operated in direct support of NASA's Earth orbiting scientific and applications satellites and Shuttle/Spacelab programs. In addition, the Network provides on a reimbursable basis services to satellites that are operated by other United States Government Agencies, such as the Department of Defense and the National Oceanic and Atmospheric Administration, by foreign governments, and by commercial companies,. Appropriate segments of the Network deliver critical coverage for the launch of spacecraft that are on deep space missions by providing support during portions of the early flight path not visible to NASA's Deep Space Network.

The NASA Communications Network provides all operational communications required by NASA. Facilities of this network link the stations of the Space Tracking and Data Network and will make it possible for the Tracking and Data Relay Satellite System to operate as a network, and with other tracking and data acquisition support elements.

GSFC provides tracking, data acquisition, communication, and control in support of the aeronautics and sounding rockets program. This includes support of balloons, sounding rockets, reentry vehicles and satellites launched from Wallops Island and other offsite range locations.

The Tracking and Data Relay Satellite System (TDRSS) will become operational during 1985 with three operational satellites in geosynchronous orbit and the White Sands Ground Terminal providing telemetry, tracking, and command support. The system employs both S- and KU-band frequencies and will greatly increase coverage capabilities available to Earth orbiting spacecraft. The network will provide the operational interface between the project users and the TDRSS. With the demonstration of a successful TDRSS, a number of Spaceflight Tracking and Data Network ground stations will be closed. However, some of the current stations will be maintained to provide for Shuttle launch and planetary support. The remaining stations will be consolidated with the Deep Space Network to provide high-Earth orbit support not available from TDRSS.

During 1985 and 1986, the GSFC Tracking Network will provide tracking support for the Space Transportation System launched payloads including Spacelab flights.

Ground station support will also be continued for a number of operating satellites such as the International Sun Earth Explorers, International Ultraviolet Explorer, Solar Maximum Mission, and Nimbus. Some examples of this support include: mission control, operational computing, and sensor data processing.

During 1985 and 1986, emphasis will continue to be placed on the operation of the Space lab, Image, and Telemetry Data Processing Facilities. In 1985, software development activities will continue relative to the Hubble Space Telescope Data Capture Facility to incorporate changes necessitated by Space Telescope integration and test activities.

Design and development of a generic data capture facility will begin in FY 1985. This system, when implemented, will minimize the repetitive development cost currently encountered in the support of different scientific missions. These activities will be continued in 1986.

In the area of mission control, work will continue in FY 1986 on the Multisatellite Operations Control Center to allow for the automation of systems in order to minimize manpower requirements for mission support. Likewise, work will proceed in the Hubble Space Telescope Operations Control Center to ready that facility for observer activities beginning in 1986.

#### CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

659

Center Management and Operations Support is support or services being provided to all Goddard Space Flight Center organizations which cannot be identified exclusively to a single program or project. The civil service personnel involved are:

DIRECTOR AND STAFF - The Center Director, Deputy Director and the immediate staff, staff organizations, e.g., Comptroller, Chief Counsel, Equal Opportunity, and Public Affairs.

MANAGEMENT SUPPORT - Those who provide information and control services supporting all levels of Center management, both program and functional. Specific functions include resources and financial management, program control, contracting and procurement, property management, personnel management, and management systems and analysis.

OPERATIONS SUPPORT - Those who provide for the operation and maintenance of institutional facilities, buildings, systems and equipment, including those who manage or provide technical services such as automated data processing, reliability and quality assurance, medical care, and photographic support.

RESOURCES REQUIREMENTS BY FUNCTION

	<u>1984</u> <u>Actual</u>	<u>1985</u>		<u>1986</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>150,285</u>	<u>154,955</u>	<u>157,626</u>	<u>153,815</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Full-time permanent.....	130,675	134,173	136,120	133,044
b. Other than full-time permanent.....	1,913	1,663	1,824	1,779
c. Overtime and other compensation.....	<u>1,627</u>	<u>1,537</u>	<u>2,139</u>	<u>2,152</u>
Subtotal, Compensation.....	134,215	137,373	140,083	136,975
2. <u>Benefit</u> .....	<u>14,426</u>	<u>15,460</u>	<u>15,375</u>	<u>14,824</u>
Subtotal, Compensation & Benefits.....	<u>148,641</u>	<u>152,833</u>	<u>155,458</u>	<u>151,799</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel .....	288	637	563	378
2. Personnel training.....	<u>1,356</u>	<u>1,485</u>	<u>1,605</u>	<u>1,638</u>
Subtotal, Supporting Costs.....	<u>1,644</u>	<u>2,122</u>	<u>2,168</u>	<u>2,016</u>
Total, Personnel and Related Costs.....	<u><u>150,285</u></u>	<u><u>154,955</u></u>	<u><u>157,626</u></u>	<u><u>153,815</u></u>



	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u> .....	<u>148,641</u>	<u>152,833</u>	<u>155,458</u>	<u>151,799</u>
1. <u>Compensation</u> .....	<u>134,215</u>	<u>137,373</u>	<u>140,083</u>	<u>136,375</u>
a. Permanent workyears.....	130,675	134,173	136,120	133,044

The increase from the 1985 Budget Estimate to the 1985 Current Estimate is due to the 1985 pay raise. The 1986 Estimate reflects a reduction due to the application of the changes required by the President's Management Improvement Initiative and the proposed reduction in pay rates.

#### Basis of Cost for Permanent Workyears

In 1986, the cost of permanent workyears will be \$133,044. The decrease from 1985 is calculated as follows:

Cost of full-time permanent workyears in 1985.....	133,044
Cost Increases in 1986.....	7,985
Within-grade and career <del>advances</del> .....	4,860
Full year cost of 1985 <del>actions</del> .....	3,390
Part year cost of 1986 <del>actions</del> .....	1,470
Full year cost of 1985 pay raise.....	1,086
Change in reimbursements <del>received</del> .....	1,591
Alteration in the method of calculating salaries <del>paid</del> .....	488
Cost Decreases in 1986.....	-7,985
Turnover savings and abolished <del>positions</del> .....	-621
Full year cost of 1985 <del>actions</del> .....	-361
Part year cost of 1986 <del>actions</del> .....	-260
1986 FTE <del>reduction</del> .....	-1,044
Proposed governmentwide salary <del>reduction</del> .....	-6,320
Cost of full-time permanent workyears in 1986.....	133,044

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full-time permanent workyears				
1. <del>cost</del> .....	1,913	1,663	1,824	1,779
2. <del>Workyears</del> .....	138	130	136	136

The distribution of 1986 workyears is as follows:

Distribution of Other than Full-time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Developmental programs.....	59
Other <del>temporary</del> .....	40
Youth opportunity programs.....	<u>37</u>
<del>Total</del> .....	<u>136</u>

The level of support remains constant for these programs.

c. Overtime and other compensation.....	1,627	1,537	2,139	2,152
---	-------	-------	-------	-------

Overtime at GSFC is required to meet peak operational requirements where additional workhours are essential, generally culminating in the launch of a manned or automated spacecraft. Some of the areas involved are fabrications, experimentation, testing, launching and tracking of the spacecraft. The increase from the 1985 budget to the 1985 current estimate reflects additional requirements during Shuttle launch activities, increasing demands for project support, and the recent pay increase. The 1986 budget estimate is based on the Center's current estimate of requirements.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
The following are the amounts of contribution by the category:				
Civil Service Retirement Fund.....	8,784	9,357	9,386	8,970
Employee life insurance.....	323	378	405	384
Employee health insurance.....	3,457	3,652	3,648	3,484
Workmen's compensation.....	283	300	300	300
FICA.....	69	74	66	66
Medicare.....	1,510	1,656	1,550	1,600
Other.....	-	43	20	20
	<u>14,426</u>	<u>15,460</u>	<u>15,375</u>	<u>14,824</u>

The decrease from the 1985 budget estimate to the 1985 current estimate is a result of a decrease in costs associated with the President's Management Improvement Initiative.

B. <u>Supporting Costs</u> .....	<u>1,644</u>	<u>2,122</u>	<u>2,168</u>	<u>2,016</u>
1. Transfer of personnel.....	<u>288</u>	<u>637</u>	<u>563</u>	<u>378</u>

The category includes the reimbursement of employees for movement of household goods to the employee's new duty station, transfer between tracking stations, and other relocation expenses. The decrease from the 1985 budget estimate to the 1985 current estimate reflects a revised number of transfers. The 1986 estimate reflects the planned level of transfers at the anticipated cost levels.

2. Personnel Training.....	<u>1,356</u>	<u>1,485</u>	<u>1,605</u>	<u>1,638</u>
----------------------------	--------------	--------------	--------------	--------------

The personnel training costs are based on current training programs and the need to reorient skills of employees into areas compatible with the direction of the current space program and GSFC's role in the program. The increase from the 1985 budget estimate to the 1985 current estimates reflects an increase in tuition costs, and development of and provisions for state-of-the-art training programs to keep pace with current technology. The 1986 estimate is based on the current estimate of requirements.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

<b>II. Travel.....</b>	<b><u>3,739</u></b>	<b><u>3,935</u></b>	<b><u>4,058</u></b>	<b><u>4,314</u></b>
------------------------	---------------------	---------------------	---------------------	---------------------

Summary of Fund Requirements

A. Program Travel.....	3,316	3,426	3,559	3,830
B. Scientific and Technical Development Travel	160	253	253	262
C. Management and Operations Travel.....	<u>263</u>	<u>256</u>	<u>246</u>	<u>222</u>
Total, Travel.....	<u>3,739</u>	<u>3,935</u>	<u>4,058</u>	<u>4,314</u>

Explanation of Fund Requirements

A. Program Travel.....	<u>3,316</u>	<u>3,426</u>	<u>3,559</u>	<u>3,830</u>
------------------------	--------------	--------------	--------------	--------------

Program travel is essential to the accomplishment of the Center's mission, particularly with regard to the Space Science and Applications, Aeronautics and Space Technology, Tracking and Data Acquisition, and Space Transportation system and space station programs. In these areas, efforts will be devoted to performing applications research, developing complex satellites and launch systems, managing data processing systems, and creating scientific instruments for further research. The increase from the 1985 budget estimate to the 1985 current estimate reflects an increase for space station expenditures. The increase in the 1986 estimate reflects approximately the same level of travel at higher anticipated travel cost and an increase for Space Station expenditures.

B. Scientific and Technical Development Travel	<u>160</u>	<u>253</u>	<u>253</u>	<u>262</u>
--	------------	------------	------------	------------

Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside GSFC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government. The increase in the FY 1986 estimate reflects approximately the same level of travel at higher anticipated travel costs.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Management and Operations Travel</u> .....	<u>263</u>	<u>256</u>	<u>246</u>	<u>222</u>

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities, travel of the Center top management to other NASA Centers and local travel in and around the Washington metropolitan area and to and from Wallops. The decrease from the 1985 budget estimate to the 1985 current estimate reflects a revised number of trips. The decrease in the 1986 estimate reflects the President's Management Improvement Initiative.

---

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>III. <u>OPERATION OF INSTALLATION</u>.....</b>	<b><u>32,749</u></b>	<b><u>40,400</u></b>	<b><u>37,798</u></b>	<b><u>41,590</u></b>

Summary of Fund Requirements

A. Facilities Services.....	17,568	21,939	20,504	24,192
B. Technical Services.....	4,608	5,200	4,767	5,999
C. Management and Operations.....	<u>10,573</u>	<u>13,261</u>	<u>12,527</u>	<u>11,399</u>
Total, Operation of Installation.....	<u>32,749</u>	<u>40,400</u>	<u>37,798</u>	<u>41,590</u>

Explanation of Fund Requirements

Operation of Installation provides a broad range of services, supplies, and equipment in support of the Center's institutional activities. These are divided into three major functional areas: (1) Facilities Services, the cost of renting real property, maintaining and repairing institutional facilities, and equipment, and the cost of custodial services and utilities; (2) Technical Services, the cost of automatic data processing for management activities, and the cost of educational and informational programs; and (3) Management and Operations, the cost of administrative communications, transportation, medical, supply, and related services.

The decrease from the 1985 budget estimate to the 1985 current estimate is primarily due to the non-approval of the operational maintenance initiative, and delay and deferral of other activities. The 1986 budget estimate provides for projected increases in support contractor rates, supplies, materials, equipment, and utility rates partially offset by the effect of the President's Management Improvement Initiative in the Management and Operations subcategory.

A. <u>FACILITIES SERVICES</u> .....	<u>17,568</u>	<u>21,939</u>	<del>20,504</del>	<u>24,192</u>
-------------------------------------	---------------	---------------	-------------------	---------------

The Greenbelt facility is located on a 552 acre main site, and on a 554 acre remote site area with a complex of laboratory and office-type buildings as well as test facilities. This complex encompasses 2.5 million *gross* square feet of building space including 34 buildings. This physical plant supports an average daily on-Center population of about 6,000. Many of the test facilities are used on schedules involving more than one shift often during off-peak hours.

The Wallops facility includes 6,175 acres and a complex of facilities which mainly consists of research, airport, and launch operations facilities. This complex encompasses 1.1 million gross square feet of building space including three major buildings. Also included are three major technical facilities. This physical plant supports an average daily on-site population of approximately 1,000.

		1985		1986	
	1984	Budget	Current	Budget	
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	
		(Thousands of Dollars)			
<u>Summary of Fund Requirements</u>					
1.	Rental of Real Property.....	668	574	739	695
2.	Maintenance and Related Services.....	3,452	5,379	5,011	6,780
3.	Custodial Services.....	3,858	4,584	4,043	4,773
4.	Utility Services.....	<u>9,590</u>	<u>11,402</u>	<u>10,711</u>	<u>11,944</u>
	Total, Facilities Services.....	<u>17,568</u>	<u>21,939</u>	<u>20,504</u>	<u>24,192</u>

Explanation of Fund Requirements

1. Rental of Real Property.....	<u>668</u>	<u>574</u>	<u>739</u>	<u>695</u>
---------------------------------	------------	------------	------------	------------

Provides space for personnel at two tracking stations and the Goddard Institute for Space Studies in New York, as well as storage and warehouse space for equipment, supplies and materials. The increase from the 1985 budget estimate to the 1985 current budget estimate more accurately reflects 1984 experience in rental payments to the General Service Administration. The decrease in the 1986 budget estimate reflects a tracking station closure and revised GSA rates.

2. Maintenance and Related Services.....	<u>3,452</u>	<u>5,379</u>	<u>5,011</u>	<u>6,780</u>
--	--------------	--------------	--------------	--------------

This activity includes general buildings maintenance such as painting, inspection and mechanical and electrical maintenance. Provides for ground maintenance and also includes supplies and facilities equipment such as building materials, electrical and electronics materials, general maintenance and operating materials. The increase from 1985 to 1986 reflects anticipated support service contractor wage rates and expected 1986 price levels for supplies, materials, equipment and other contractual effort.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. Custodial Service.....	<u>3,858</u>	<u>4,584</u>	<u>4,043</u>	<u>4,773</u>

The estimate provides for janitorial, plant security, fire fighting and ambulance services. These services include washing and relamping of light fixtures, office cleaning, minor laundry services, trash removal, badging of all on-site personnel and visitors, vehicle identification, and fire fighting. The decrease from the 1985 budget estimate to the 1985 current estimate reflects 1984 experience. The increase in the 1986 budget estimate is due to anticipated rate changes in support service contracts and the required enhancement of security and fire protection.

4. Utility Services.....	<u>9,590</u>	<u>11,402</u>	<u>10,711</u>	<u>11,944</u>
--------------------------	--------------	---------------	---------------	---------------

The estimate provides for operation and maintenance of the utility plant and distribution systems as well as the purchase of utility services, and supplies, materials and equipment required for the maintenance of these systems. At the Greenbelt facility, electricity is purchased from the Potomac Electric and Power Company, natural gas from the Washington Gas Light Company and fuel oil from a local supplier. Water and sewage service is provided by the Washington Suburban Sanitary Commission. The only purchased utilities at Wallops are electricity and fuel oil to operate the heating plant. This funding also provides for the operation and maintenance of the heating plant and water and sewage facilities. The decrease from the 1985 budget estimate to the 1985 current estimate is based on current rate estimates and consumption estimates based on 1984 experience. The increase in 1986 provides for anticipated utility and support service contractor rate increases.



	1984 <u>Actual</u>	1985 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1986 <u>Budget</u> <u>Estimate</u>
B. TECHNICAL SERVICES.....	<u>4,608</u>	<u>5,200</u>	<u>4,767</u>	<u>5,999</u>

Summary of Fund Reauirements

1. Automatic Data Processing.....	<u>2,980</u>	<u>3,319</u>	<u>3,917</u>	<u>5,065</u>
a. Equipment.....	413	1,227	809	1,306
b. Operations.....	<u>2,567</u>	<u>2,092</u>	<u>3,108</u>	<u>3,759</u>
2. Scientific and Technical Information	<u>1,301</u>	<u>1,459</u>	<u>657</u>	<u>676</u>
a. Library.....	986	1,077	31	44
b. Education and Information.....	<u>315</u>	<u>382</u>	<u>626</u>	<u>632</u>
3. Shop Support Services.....	<u>327</u>	<u>422</u>	<u>193</u>	<u>258</u>
Total, Technical Services.....	<u>4,608</u>	<u>5,200</u>	<u>4,767</u>	<u>5,999</u>

Exvlanation of Fund Reauirements

1. Automatic Data Processing.....	<u>2,980</u>	<u>3,319</u>	<u>3,917</u>	<u>5,065</u>
-----------------------------------	--------------	--------------	--------------	--------------

This funding provides accounting and management information to satisfy management requirements. The lease and purchase costs of all administrative ADP hardware are included in this estimate. Leased equipment includes disk drives, various terminals, and other peripheral equipment. The systems supported include institutional management, finance and accounting, procurement and personnel management. The increase in the 1985 current estimate is due to a combination of increased costs for contractor support for programming services and to budgeting for purchase of ADP equipment to enhance employee productivity. The 1986 estimate provides for recurring costs of administrative computer operations, and equipment lease and purchases to upgrade existing capability.

2. Scientific and Technical Information	<u>1,301</u>	<u>1,459</u>	<u>657</u>	<u>676</u>
---	--------------	--------------	------------	------------

These funds provide for a public affairs educational and informational program, and support to the Center in the provision of various scientific and technical information services. This estimate also provides for exhibit management and refurbishment, demonstration models, workshops and symposia, and educational and information materials. The decrease from the 1985 budget estimate to the 1985 current estimate reflects the movement of the technical library operations to a more appropriate fund source and to reflect the 1984 Actuals. The 1986 effort reflects anticipated increased costs for subscriptions for the non-technical organizations.

3. Shop Support Services.....	<u>327</u>	<u>422</u>	<u>193</u>	<u>258</u>
-------------------------------	------------	------------	------------	------------

Support is provided in the areas of safety, fire protection system maintenance and related supplies and equipment. Engineering and fabrication support for facility planning and alteration and safety, reliability, and quality assurance requirements and other technical services are included in this category. The decrease from the 1985 budget estimate to the 1985 current estimate reflects the reclassification of photo and graphic services, and publications, to a more applicable fund source. The 1986 effort reflects funding of essentially the same level of services as in 1986, plus equipment replacement.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. MANAGEMENT AND OPERATIONS.....	<u>10,573</u>	<u>13,261</u>	<u>12,527</u>	<u>11,399</u>

Summary of Fund Requirements

1. Administrative Communications.....	4,257	4,965	4,949	4,815
2. Printing and Reproduction.....	180	374	52	70
3. <del>Transportation</del> .....	2,452	3,297	2,793	2,628
4. Installation Common Services.....	<u>3,684</u>	<u>4,625</u>	<u>4,733</u>	<u>3,886</u>
Total, Management and Operations.....	<u>10,573</u>	<u>13,261</u>	<u>12,527</u>	<u>11,399</u>

Explanation of Fund Requirements

1. Administrative Communications.....	<u>4,257</u>	<u>4,965</u>	<u>4,949</u>	<u>4,815</u>
---------------------------------------	--------------	--------------	--------------	--------------

The estimate provides for local telephone service, long distance telephone service, and other non-telephone communications. Local telephone services cover 3,900 PBX internal lines and 6,000 telephone instruments. There are ten tielines for Baltimore-area communications. Four hundred Centrex lines are used for computer data operations. Other communication services include teletype costs including the GSA Automatic Records System (ARS), United Press International Wire Service for the public affairs office and telephone operators. The 1985 budget estimate reflects 1984 experience and the impact of divestiture. The 1986 estimate reflects the President's Management Improvement Initiative.

2. Printing and Reproduction.....	<u>180</u>	<u>374</u>	<u>52</u>	<u>70</u>
-----------------------------------	------------	------------	-----------	-----------

The current 1985 estimate reflects the recategorization of costs for printing and reproduction services to a more suitable fund source. Maintenance of copiers in administrative offices remains in this category. 1986 estimate provides for level services at anticipated cost for maintenance services.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. Transportation.....	<u>2,452</u>	<u><del>3,297</del></u>	<u>2,793</u>	<u>2,628</u>

This estimate provides the following services: operation of a transportation center; maintenance and repair of the Wallops administrative aircraft; Purchase of replacement vehicles; supplies and equipment for vehicle maintenance; and special vehicle rental. The decrease from the 1985 budget estimate to the 1985 current estimate is due to a decrease in support contractor rates, and reflects the one-time purchase of replacement vehicles in 1984, thereby reducing 1985 requirements. The 1986 budget estimate reflects the President's Management Improvement Initiative.

4. Installation Common Services.....	<u>3,684</u>	<u>4,625</u>	<u>4,733</u>	<u>3,886</u>
--------------------------------------	--------------	--------------	--------------	--------------

This activity supports Center management and staff activities, provides medical services, and covers various installation support services. Funding includes patent searches and applications; materials, equipment maintenance, (microfilm, copiers, special typewriters) for staff offices; operation of the GSFC on-site health unit and medical services for the Goddard Institute for Space Studies employees in New York; provides for emergency care on-site, annual physical exams for Goddard employees, fitness programs, immunizations and counselling. Annual physical exams are provided for approximately 3,600 employees at the Center. The necessary supplies, materials, and equipment for operation of the health unit are included. This category also provides funding for packing and crating; rigging equipment for shipment; storage and warehousing; and moving and hauling. The decrease from the 1985 current estimate to the 1986 budget estimate reflect the President's Management Improvement Initiative.

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**  
**GODDARD SPACE FLIGHT CENTER**  
**Greenbelt, Maryland**  
**FISCAL YEAR 1986 ESTIMATE**

DIRECTOR DEPUTY DIRECTOR		
	85	86
SES	5	5
EXCEPTED	0	0
GS 16	0	0
GS 15	1	1
GS 14	0	0
OTHER GS	6	6
WAGE GRADE	0	0
TOTAL	12	12

NASA OFFICE OF  
INSPECTOR GENERAL  
GSFC FIELD OFFICE

COMPTROLLER		
	85	86
SES	2	2
EXCEPTED	0	0
GS 16	0	0
GS 15	4	4
GS 14	4	4
OTHER GS	95	94
WAGE GRADE	0	0
TOTAL	105	104

DIRECTOR OF FLIGHT ASSURANCE		
	85	86
SES	1	1
EXCEPTED		
GS 16		
GS 15		
GS 14	23	23
OTHER GS	74	73
WAGE GRADE		
TOTAL	116	115

TOTAL		
	85	86
SES	53	53
EXCEPTED	3	3
GS 16	1	1
GS 15	313	308
GS 14	540	526
OTHER GS	2597	2569
WAGE GRADE	126	126
TOTAL	3633	3586

CHIEF COUNSEL		
	85	86
SES	1	1
EXCEPTED	0	0
GS 16	0	0
GS 15	1	1
GS 14	2	2
OTHER GS	6	6
WAGE GRADE	0	0
TOTAL	10	10

EQUAL OPPORTUNITY PROGRAMS OFFICE		
	85	86
SES	0	0
EXCEPTED	0	0
GS 16	0	0
GS 15	0	0
GS 14	1	1
OTHER GS	4	4
WAGE GRADE	0	0
TOTAL	5	5

OFFICE OF PUBLIC AFFAIRS		
	85	86
SES	0	0
EXCEPTED	0	0
GS 16	0	0
GS 15	1	1
GS 14	3	3
OTHER GS	12	11
WAGE GRADE	0	0
TOTAL	16	15

DIRECTOR OF MANAGEMENT OPERATIONS		
	85	86
SES	3	3
EXCEPTED	1	1
GS 16	0	0
GS 15	15	15
GS 14	38	37
OTHER GS	516	511
WAGE GRADE	126	126
TOTAL	699	693

DIRECTOR OF FLIGHT PROJECTS		
	85	86
SES	11	11
EXCEPTED	0	0
GS 16	0	0
GS 15	69	68
GS 14	85	81
OTHER GS	140	138
WAGE GRADE	0	0
TOTAL	305	298

DIRECTOR OF MISSIONS OPERATIONS DATA SYSTEMS		
	85	86
EXCEPTED		
GS 16		
GS 15	49	48
GS 14	104	102
OTHER GS	454	449
WAGE GRADE		
TOTAL	612	604

DIRECTOR OF SPACE AND EARTH SCIENCES		
	85	86
SES	16	16
EXCEPTED	2	2
GS 16	1	1
GS 15	96	94
GS 14	128	125
OTHER GS	517	512
WAGE GRADE	0	0
TOTAL	760	750

DIRECTOR OF ENGINEERING		
	85	86
SES	6	6
EXCEPTED	0	0
GS 16	0	0
GS 15	48	47
GS 14	124	121
OTHER GS	565	559
WAGE GRADE	0	0
TOTAL	143	133

DIRECTOR OF SUBORBITAL PROJECTS AND OPERATIONS		
	85	86
EXCEPTED		
GS 15	11	11
GS 14	28	27
OTHER GS	208	206
WAGE GRADE	0	0
TOTAL	250	247

LEWIS  
RESEARCH CENTER

## **RESEARCH AND PROGRAM MANAGEMENT**

### **FISCAL YEAR 1986 ESTIMATES**

#### **LEWIS RESEARCH CENTER**

##### **DESCRIPTION**

The Lewis Research Center (LeRC) occupies two sites in north central Ohio. The original site, established in 1941, adjacent to the Cleveland-Hopkins International Airport, includes 366 acres, 14 of which are leased from the City of Cleveland. There are over 170 buildings and structures, including wind tunnels, test chambers, laboratories and other research facilities at the Cleveland location.

The Plum Brook Station, established in 1956, is located south of Sandusky, Ohio, about 50 miles west of Cleveland, on land formerly occupied by the Plum Brook Ordnance works. There are 6,355 acres owned by NASA and approximately 47 acres in easements. There are 69 buildings and 99 concrete storage bunkers. A 100kw wind turbine generator research facility is in operation for a program jointly sponsored by NASA and the U.S. Department of Energy. During 1975, consistent with future NASA research and technology needs, the principal facilities were placed in a standby mode. Since then a number of Federal, state and local government agencies have utilized office space and other facilities. The Garrett Corporation presently leases the Space Power Facility (SPF). The lease was renewed on November 1, 1979, and covers a six-year period with two one-year extensions possible. The Garrett Corporation utilizes the SPF to manufacture gas centrifuges for the Department of Energy.

The total capital investment of Lewis and Plum Brook Station, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1984, was \$497,882,000.

##### **CENTER ROLES AND MISSIONS**

Lewis was established as an aircraft engine research laboratory to develop superior aircraft propulsion systems. Since then, Lewis has developed and constructed many unique facilities for testing full-scale aircraft engines and engine components, primary and auxiliary rocket engines and electric propulsion systems, space and terrestrial power generation systems, and space communication systems. The principal and supporting roles are:

##### **PRINCIPAL**

Aeronautics - develop and maintain a preeminent national capability in: fundamental aeropropulsion disciplines including internal computational fluid dynamics, internal unsteady aerodynamics and aeroelasticity, hot section technology aircraft icing phenomena; aeronautical propulsion and power

technologies including engine materials and structures, propulsion system integration, propellers, instrumentation and controls: and the associated research facilities and techniques.

Space Station - definition and development of the initial operating capability space Station power system.

Communications - develop the high-risk technology required to ensure continued U.S. preeminence in satellite communications and which will be applicable to a wide range of future communication system required by NASA, other Government Agencies and U.S. Industry. Design, develop and manage the Advanced Communications Technology Satellite System for enabling growth in the capacity and effective utilization of the radio frequency spectrum.

Expendable Launch Vehicles - management and operation of the Atlas and Centaur launch vehicle systems for Government and commercial users.

Space Transportation System/High Energy Upper Stage - design, develop and manage the Shuttle Centaur Cryogenic Upper Stage for the Space Transportation System to support the launch of the Galileo, Ulysses, Venus Radar Mapper, and DOD missions.

Space Propulsion Systems Technology - development and maintenance of the technology base for advanced primary and auxiliary space propulsion systems, including associated structures and materials technologies.

Space Energy Processes and Systems Technology - development and maintenance of the technology base for space power and energy conversion systems, including associated structures and materials.

In-Space Flight Experiments - develop and implement basic microgravity science experiments, especially in materials processing, and conduct flight experiments that contribute to technology developments for space power and propulsion systems.

#### SUPPORTING

Energy Processes and Systems Technology - management of research and technology projects for terrestrial energy generation and conservation systems.



**SUMMARY OF RESOURCES REQUIREMENTS**

**Funding Plan by Function**

	1984 <u>Actual</u>	1985 <u>Budget Estimate</u>	<u>Current Estimate</u>	1986 <u>Budget Estimate</u>
I. Personnel and Related Costs.....	104,146	108,264	110,037	107,852
II. Travel.....	2,045	2,178	2,521	2,726
III. Operation of Installation.....	22,513	30,061	26,700	29,318
A. Facilities Services.....	(17,160)	(22,877)	(20,286)	(22,757)
B. Technical Services.....	( 2,003)	( 2,182)	( 1,927)	( 2,209)
C. Management and Operations.....	( 3,350)	( 5,002)	( 4,487)	( 4,352)
Total, fund requirements.....	<u>128,704</u>	<u>140,503</u>	<u>139,258</u>	<u>139,896</u>

Distribution of Permanent Civil Service Workyears

	<u>1984</u> <u>Actual</u>	<u>1985</u> <u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>1986</u> <u>Budget</u> <u>Estimate</u>
<u>RESEARCH AND DEVELOPMENT</u>	<u>1,978</u>	<u>1,950</u>	<u>1,991</u>	<u>2,001</u>
<u>Space Station.....</u>	<u>-</u>	<u>25</u>	<u>155</u>	<u>205</u>
<u>Space Transportation.....</u>	<u>128</u>	<u>124</u>	<u>130</u>	<u>130</u>
<u>Space Science and Applications.....</u>	<u>119</u>	<u>112</u>	<u>135</u>	<u>141</u>
Space Applications.....	119	112	135	141
<u>Commercial Programs.....</u>	<u>2</u>	<u>2</u>	<u>7</u>	<u>7</u>
Technology Utilization.....	2	2	2	2
Commercial Use of Space	0	0	5	5
<u>Aeronautics and Space Technology.....</u>	<u>1,729</u>	<u>1,687</u>	<u>1,564</u>	<u>1,518</u>
Aeronautics.....	1,339	1,310	1,211	1,165
Space.....	390	377	353	353
<u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS</u>	<u>64</u>	<u>65</u>	<u>64</u>	<u>54</u>
Space Transportation Operations.....	64	65	64	54
Subtotal, direct workyears... ..	<u>2,042</u>	<u>2,015</u>	<u>2,055</u>	<u>2,055</u>
<u>CENTER MANAGEMENT AND OPERATIONS.....</u>	<u>592</u>	<u>576</u>	<u>549</u>	<u>527</u>
Total, full-time workyears.....	2,634	2,591	2,604	2,582
Other than full-time workyears.....	96	125	112	<u>110</u>
Total, workyears.....	<u>2,730</u>	<u>2,716</u>	<u>2,716</u>	<u>2,692</u>

GRAM DESCRIPTION

RESEARCH AND DEVELOPMENT

Permanent Civil  
Service Workyears

SPACE STATION..... 205

Space Station effort will consist of definition and integration studies and advanced technology development. Lewis was assigned the role of responsible Center for the definition and development of the Power System for the initial operating capability (IOC) Space Station. Lewis manages an agency wide advanced development program to define power system technology options for the IOC Space Station and also manages a portion of the propulsion advanced development effort.

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT..... 130

Design, development, production and operation of the Centaur G and Centaur G-Prime cryogenic upper stages are managed by the Shuttle/Centaur Project Office at Lewis. In 1986, civil service personnel will continue to support the activities associated with fabrication and qualification of both vehicle types. Significant efforts will include integration of the Centaur into the Space Transportation System's Kennedy Space Center operation and the production of G vehicles for the 1988 Venus Radar Mapper mission and various DOD missions. The first Centaur G will be delivered to Kennedy Space Center and fabrication of the second G vehicle will be completed. Major milestones in 1986 will be the initial launches of Centaur G-Prime vehicles in support of the Galileo and Ulysses missions.

SPACE APPLICATIONS..... 141

The Space Applications activity at Lewis consists principally of space communications research. In 1986, civil service personnel will continue to support studies of various advanced satellite communication system concepts directed at providing additional frequency bands and improved communications service. These studies are being focused on the needs of the public and private sectors, both nationally and internationally. Lewis will continue to developing technology with possible application to both ground and space segments of future advanced civil and military communication systems. In addition, Lewis has management responsibility for design and development activities on the Advanced Communication Technology Satellite leading to a launch in 1989.

In 1986, Lewis will be continue to pursue advanced design and development of scientific flight experiments in basic science and technology associated with materials combustion and fluid dynamics phenomenon in reduced gravity.

TECHNOLOGY UTILIZATION..... 2

The 1986 technology utilization program at Lewis will continue to concentrate on the identification and evaluation of technology which can be transferred to the non-aerospace industry, and on active programs to communicate and transfer the technology.

COMMERCIAL UTILIZATION OF SPACE..... 5

The objective of the Commercial Use of Space program is to increase private sector awareness of space opportunities and encourage increased industry investment and participation in high technology space-based research and development. This effort will establish an organizational focal point to initiate a program specifically intended to foster commercial use and access to space.

AERONAUTICS TECHNOLOGY..... 1,165

Lewis' major research and technology responsibility in aeronautics is propulsion. The primary goal is to establish aeropropulsion technology which contributes significantly to the continuing preeminence of the U.S. civil and military aircraft industry. The approach is to provide the technology base for developing advanced aeronautical propulsion systems which will lead to improvements in fuel efficiency, operating cost, reliability and durability, and which will operate with acceptable environmental impact. The Lewis aeropropulsion program includes key generic discipline research; focused interdisciplinary research; and efforts focused on specific propulsion systems/vehicle applications. In 1986, Civil Service personnel will be involved in conducting the program described below.

The generic discipline research includes internal computational fluid mechanics (ICFM), materials, and computational structural mechanics. The objective of this research is to develop an understanding of the physical phenomena involved in these disciplines so that accurate analytical tools can be developed to predict and to improve propulsion system performance. The scope of the ICFM research includes computational methods, modeling and verification, and applications. The advanced materials research is focused on super-alloys, intermetallics, coatings, ceramics and composites for high temperature propulsion system applications. Computational structural mechanics involves the development and verification of advanced analytical methods for structural dynamics, fracture mechanics, and the development of life prediction methodology.

The focused interdisciplinary propulsion research includes icing, instrumentation and control technology, and hot section technology. Icing research brings together disciplines such as fluid mechanics and heat transfer to improve the analytical tools required for predicting icing effects, and to develop advanced ice

protection systems. The goal of the icing research is to develop the technology base required to provide all-weather capability for civil and military aircraft. The focus of the instrumentation and controls technology is the development of nonintrusive research instrumentation and engine sensors/controls for the "smart" adaptive propulsion systems of the future. Hot section technology is aimed at providing improved durability and reliability of high temperature propulsion system components through the development of improved experimental and analytical tools.

In engine systems research, Lewis is developing focused propulsion technology for specific engines and propulsion systems. Research and technology in this area involves small engines (gas turbines and intermittent combustion engines); advanced turboprops (including a flight test planned for 1987), convertible engines; variable cycle engines; and new, innovative propulsion systems. Applications for this focused propulsion system research include subsonic transports, commuter and general aviation aircraft, rotorcraft, supersonic STOVL aircraft, and supersonic/hypersonic aircraft.

The Lewis aeropropulsion technology program is supported by advanced propulsion system studies and by propulsion facilities ranging from small research test rigs to large propulsion system altitude tanks and wind tunnels.

Permanent Civil  
Service Workyears

SPACE TECHNOLOGY.....

353

The major roles of Lewis in space research and technology are to advance the state of the art and maintain a technology base for power systems, advanced primary and auxiliary propulsion and space communications. This includes associated materials technology, structural analysis and life prediction technology, power management and distribution technology, and technology and advanced development work in support of a space station and its evolutionary growth. In-space flight experiments are defined, developed and implemented in the context of the above technology areas and in the underlying basic sciences. In 1986, Civil Service personnel will be used in the activities described below.

The Lewis primary propulsion programs emphasize the extension and advancement of the technologies of existing and conceptual hydrogen- or hydrocarbon-fueled engines such as the Space Shuttle Main Engine toward long-life, reusable, serviceable high-performance engine systems for Earth-to-orbit applications. This effort concentrates on thrust chamber cooling and life enhancement, critical turbomachinery components such as bearings, seals, improved materials, advanced structural analysis and life prediction and maintenance diagnostics. Another thrust is to provide the technology for improving orbital transfer propulsion systems in the areas of versatility, performance, life and reusability. Both high- and low-thrust systems will be investigated with emphasis on combustion and heat transfer, long-life lightweight reusable components, and high expansion area nozzles. Aerojets are also being investigated.

The Lewis auxiliary propulsion programs are directed toward space station and satellite applications. Technologies for gaseous hydrogen-oxygen thrusters, resistojets capable of using various fuels, inert gas ion, and storable chemical engines are being developed. Research is being pursued on electrothermal engines and new concepts.

Lewis does basic science and technology work and conducts in-space science and technology experiments in materials, combustion and fluid dynamics in reduced gravity. This defines and accomplishes science experiments with the scientific community in universities, industry, and government. Critical space experiments in support of power systems technology advances, thermal management and propulsion systems are carried out. The latter involves investigations of cryogenic propellant management under reduced gravity.

Space power generation programs include solar photovoltaic, solar dynamic, electrochemical energy conversion and storage, nuclear energy conversion, and power component and circuit development. The photovoltaic program is directed toward an improvement in solar cell efficiency, reduced cost and improved operating life. The solar dynamic effort seeks a higher efficiency alternative that achieves reduced weight and structural area amenable to high power levels. Electrochemical research and development supports extended operating life and improved energy density for space batteries and fuel cell components and systems. The nuclear energy conversion program, a NASA/DARPA/DOE program, is directed toward determining the feasibility of a 100 kilowatt class nuclear reactor space power system.

Power component and circuit technology development for management of multihundred kilowatt power systems on space vehicles of the future, and new modes of power generation and conversion are being investigated. The interactions of the space plasma environment with high-voltage power systems and components are also being studied, and technology is being developed to control these interactions and prevent power system inefficiencies and failures.

The space communications program includes applied research and advanced development in microwave electron beam amplifiers, microwave solid-state devices, and antenna systems. The program consists of efforts to develop advanced concepts, techniques, and communications systems components which will enable growth in the utilization of the radio frequency spectrum to frequencies well beyond 100GHz.

The Lewis program in space materials and structures research and technology emphasizes the development of improved materials, advanced structural analysis and life prediction for advanced space power generation, propulsion and communications systems. The research and technology program includes environmental effects on superalloys and protective coatings, ceramics and composites, lubrication for mechanical components and protective coatings and life prediction for reusable space propulsion system.

SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS

Permanent Civil  
Service Workyears

SPACE TRANSPORTATION OPERATIONS.....

54

This program is responsible for the delivery to specified orbit of all spacecraft launched by the Atlas/Centaur vehicle. The program includes the procurement of vehicle systems hardware, launch services, and engineering and management support, as well as development, maintenance and operation of ground support equipment. In 1986, civil service personnel working in the Atlas/Centaur launch vehicle program will support the FLTSATCOM program.

CENTER MANAGEMENT AND OPERATIONS SUPPORT.. ..

527

Center Management and Operations Support is defined as support or services being provided to all Lewis organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director, and immediate staff, e.g., Technology Utilization, Equal Opportunity, and Public Affairs.

Management Support - Those who provides information and control services supporting all levels of Center program and functional management. Specific functions include resources planning and management, legal and patent counsel, contracting and procurement, personnel management, property management, financial management, and management information systems and analysis.

Operations Support - Those who provides for the operation and maintenance of institutional facilities, buildings, systems, and equipment, including those who manage or provide technical services such as general automatic data processing, reliability and quality assurance, medical care, and graphics support.

# RESOURCES REQUIREMENTS BY FUNCTION

	1984 <u>Actual</u>	1985		1986
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>104,146</u>	<u>108,264</u>	<u>110,037</u>	<u>107,852</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Full-time permanent.....	89,196	91,505	93,595	90,986
b. Other than full-time permanent .....	1,589	2,040	1,933	2,335
c. Overtime and other compensation.....	<u>1,390</u>	<u>1,496</u>	<u>1,590</u>	<u>1,894</u>
Subtotal, Compensation.....	92,175	95,041	97,118	95,215
2. <u>Benefits</u> .....	<u>10,903</u>	<u>12,343</u>	<u>11,954</u>	<u>11,632</u>
Subtotal, Compensation and Benefits....	<u>103,078</u>	<u>107,384</u>	<u>109,072</u>	<u>106,847</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel .....	34	60	45	75
2. Personnel training.....	<u>1,034</u>	<u>820</u>	<u>920</u>	<u>930</u>
Subtotal, Supporting Costs.....	<u>1,068</u>	<u>880</u>	<u>965</u>	<u>1,005</u>
Total, Personnel & Related Costs.....	<u>104,146</u>	<u>108,264</u>	<u>110,037</u>	<u>107,852</u>



### Explanation of Fund Requirements

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u> .....	<u>103,078</u>	<u>107,384</u>	<u>109,072</u>	<u>106,847</u>
1. <u>Compensation</u> ....	<u>92,175</u>	<u>95,041</u>	<u>97,118</u>	<u>95,215</u>
a. Full-time permanent.....	89,196	91,505	93,595	90,986

The current estimate for 1985 reflects an increase from the 1985 budget estimate due to the pay raise increase. The 1986 estimate reflects a reduction due to the application of the changes required by the President's Management Improvement Initiative and the proposed reduction in pay rates.

### Basis of Cost for Permanent Workyears

In 1986, the cost of permanent workyears will be \$90,986,000. The decrease from the 1985 level results from the following:

Cost of full-time permanent workyears in 1985.....	93,595
Cost Increases in 1986.....	2,978
Within-grade and career <del>advances</del> .....	1,969
Full year cost of 1985 <del>actions</del> .....	983
Part year cost of 1986 <del>actions</del> .....	986
Full year cost of 1985 pay <del>raise</del> .....	694
Alteration in the method of calculating salaries <del>paid</del> .....	315
Cost Decreases in 1986.....	-5,587
Turnover savings and abolished positions .....	-349
Full year cost of 1985 <del>actions</del> .....	-313
Part year cost of 1986 <del>actions</del> .....	-36
1986 FTE <del>reduction</del> .....	-792
Proposed governmentwide salary <del>reduction</del> .....	-4,446
Cost of full-time permanent workyears in 1986.....	90,986

	1984	1985		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full-time permanent				
1. cost.....	1,589	2,040	1,933	2,335
2. Workyears.....	106	138	125	123

The distribution of 1986 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program.....</u>	<u>Workyears</u>
Development programs.....	52
Summer employment program.....	12
Youth opportunity programs.....	13
Other temporary.....	<u>46</u>
Total.....	<u>123</u>

The reduction from the 1985 budget estimate to the 1985 current estimate is due to a change in the permanent, non-permanent FTE mix. The 1986 budget estimate reflects a realignment of skill mix in the temporary employment programs.

c. Overtime and other compensation.....	1,390	1,496	1,590	1,894
---	-------	-------	-------	-------

The 1985 current estimate is higher than the 1985 budget estimate due to a higher level of incentive awards than previously planned. The 1986 estimate reflects requirements related to the projected LeRC test schedule.

	1984	1985		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. <u>Benefits</u> .....	<u>10,903</u>	<u>12,343</u>	<u>11,954</u>	<u>11,632</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	6,358	6,716	6,824	6,365
Employee life insurance.....	225	266	236	255
Employee health insurance.....	2,760	3,211	2,827	2,895
Workmen's compensation.....	424	587	587	587
FICA.....	55	334	260	300
Medicare.....	1,076	1,193	1,200	1,210
Other benefits.....	<u>5</u>	<u>36</u>	<u>20</u>	<u>20</u>
Total.....	<u>10,903</u>	<u>12,343</u>	<u>11,954</u>	<u>11,632</u>

The decrease from the 1985 budget estimate to the 1985 current estimate is primarily due to a decrease in employee health insurance and FICA benefits. The 1986 estimate reflects a reduction due to the application of the changes required by the President's Management Improvement Initiative.

B. <u>Supporting Costs</u> .....	<u>1,068</u>	<u>880</u>	<u>965</u>	<u>1,005</u>
1. Transfer of personnel.. ..	34	60	45	75

The 1986 budget estimate increase reflects a higher number of relocations.

2. Personnel training.....	1,034	820	920	930
----------------------------	-------	-----	-----	-----

The purpose of the training program is to provide for the development and education of civil service employees to more efficiently support LeRC roles and missions. The increase from the 1985 budget estimate to the 1985 current estimate is a result of Lewis' increased emphasis on the acquisition of the power system for the space station and freshout new hires training. The 1986 estimate reflects the same level of training as 1985.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
<b>II. <u>TRAVEL</u>.....</b>	<b><u>2,045</u></b>	<b><u>2,178</u></b>	<b><u>2,521</u></b>	<b><u>2,726</u></b>

Summary of Fund Requirements

A. Program Travel.....	1,294	1,595	1,884	2,097
B. Scientific and Technical Development Travel	349	340	394	410
C. Management & Operations Travel.....	<u>402</u>	<u>243</u>	<u>243</u>	<u>219</u>
Total, Travel.....	<u>2,045</u>	<u>2,178</u>	<u>2,521</u>	<u>2,726</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>1,294</u>	<u>1,595</u>	<u>1,884</u>	<u>2,097</u>
--------------------------------	--------------	--------------	--------------	--------------

Program travel is directly related to the accomplishment of the Center's mission and accounts for approximately 77 percent of travel costs. These funds are necessary for the management of major contractual programs in aeronautical research and technology, space station, space propulsion, materials research and development and space energy processes and systems technology. Program travel is also essential to the management and procurement of launch vehicles and the Advanced Communication Technology Satellite (ACTS). The increase from the 1985 budget estimate to the 1985 current estimate is due to Space Station and ACTS. The 1986 budget estimate provides for an increase in travel due to the Space Station, ACTS and the Atlas/Centaur launch vehicle program.

B. <u>Scientific and Technical Development Travel</u> ..	<u>349</u>	<u>340</u>	<u>394</u>	<u>410</u>
--	------------	------------	------------	------------

Scientific and technical development travel provides employees the opportunity to participate in meetings and seminars with other representatives of the aerospace community. The benefits derived from exposure to technological advances outside Lewis, as well as to present both accomplishments and problems to their associates is invaluable. Many of the meetings are working panels convened to solve problems for the benefit of the Government. The increase from the 1985 budget estimate to the 1985 current estimate reflects increased support of presentations of technical papers to the scientific community. The 1986 estimate provides for a continuation of this increased emphasis.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Management and Operations Travel</u> .....	<u>402</u>	<u>243</u>	<u>243</u>	<u>219</u>

Management and operations travel is required for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, procurement, travel of the Center's top management to NASA Headquarters and other NASA Centers, and local transportation. The 1986 estimate reflects a reduction due to the application of the changes required by the President's Management Improvement Initiative.

---

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>III. <u>OPERATION OF INSTALLATION</u>.....</b>	<b><u>22,513</u></b>	<b><u>30,061</u></b>	<b><u>26,700</u></b>	<b><u>29,318</u></b>

Summary of Fund Requirements

A. Facilities Services.....	17,160	22,877	20,286	22,757
B. Technical Services.....	2,003	2,182	1,927	2,209
C. Management and Operations.....	<u>3,350</u>	<u>5,002</u>	<u>4,487</u>	<u>4,352</u>
Total, Operation of Installation.....	<u>22,513</u>	<u>30,061</u>	<u>26,700</u>	<u>29,318</u>

Explanation of Fund Requirements

Operation of Installation provides a broad range of services, supplies and equipment in support of the Center's institutional activities. These are divided into three major functional areas: (1) Facilities Services, the cost of maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; (2) Technical Services, the cost of automatic data processing for management activities and the cost of educational and informational programs and technical shops supporting institutional activities; and (3) Management and Operations, the cost of administrative communications, printing and reproduction, transportation, medical services and supplies.

The decrease from 1985 budget estimate to the 1985 current estimate is due primarily to the non-approval of the Agency's operational maintenance initiative. The 1986 estimate provides for increases in support contractor, utilities, and communication rates offset by a reduction due to the application of the changes required by the President's Management Initiative.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		Thousands	of Dollars)	
<b>A. <u>FACILITIES SERVICES</u>.....</b>	<b><u>17,160</u></b>	<b><u>22,877</u></b>	<b><u>20,286</u></b>	<b><u>22,757</u></b>

Summary of Fund Requirements

1. <u>Maintenance &amp; Related Services</u> .....	2,431	4,331	3,367	4,300
2. <u>Custodial Services</u> .....	3,593	4,053	3,890	4,429
3. <u>Utility Services</u> .....	<u>11,136</u>	<u>14,493</u>	<u>13,029</u>	<u>14,028</u>
Total, Facilities Services.....	<u>17,160</u>	<u>22,877</u>	<u>20,286</u>	<u>22,757</u>

Explanation of Fund Requirements

1. <u>Maintenance and Related Services</u> .....	<u>2,431</u>	<u>4,331</u>	<u>3,367</u>	<u>4,300</u>
--	--------------	--------------	--------------	--------------

This activity provides for the operation and maintenance of facilities at the main installation in Cleveland and at the Plum Brook Station. Facilities maintenance includes buildings and grounds maintenance and maintenance of heating, ventilating, and air-conditioning systems and equipment. The decrease from the 1985 budget estimate to the 1985 current estimate reflects the non-approval of the Agency's operational maintenance initiative offset by increased costs for support service contracts. The 1986 estimate includes a level of maintenance, consistent with the National investment in the Lewis physical plant.

2. <u>Custodial Services</u> .....	<u>3,593</u>	<u>4,053</u>	<u>3,890</u>	<u>4,429</u>
------------------------------------	--------------	--------------	--------------	--------------

Security and janitorial services are provided by support contractors. Other services include rubbish disposal and industrial cleaning of walls and lights on an as needed basis. The decrease from the 1985 budget to the 1985 current estimate is due primarily to lower support contractor rates that originally anticipated. The increase in the 1986 budget estimate is due to anticipated rate changes in support service contracts.

	1984	1985		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Utility Services</u> .....	<u>11,136</u>	<u>14,493</u>	<u>13,029</u>	<u>14,028</u>

Electrical power is provided by the local utility company. A support contractor operates the central heating plant. The decrease from the 1985 budget estimate to the 1985 current estimate is due to lower utility rates than originally anticipated. The increase from 1985 to 1986 is attributable to utility rate increases in electricity and natural gas and support contractor rate increases, at a useage level consistent with the planned test schedule.



	<u>1984</u> <u>Actual</u>	<u>1985</u>		<u>1986</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
B. <u>Technical Services.....</u>	<u>2,003</u>	<u>2,182</u>	<u>1,927</u>	<u>2,209</u>

Summary of Fund Requirements

1. <u>Automatic Data Processing.....</u>	<u>1,602</u>	<u>1,440</u>	<u>1,376</u>	<u>1,511</u>
a. <u>Equipment.....</u>	961	265	372	375
b. <u>Operations.....</u>	641	1,175	1,004	1,136
2. <u>Scientific and Technical Information.....</u>	<u>401</u>	<u>742</u>	<u>551</u>	<u>698</u>
Total, Technical Services.....	<u>2,003</u>	<u>2,182</u>	<u>1,927</u>	<u>2,209</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing.....</u>	<u>1,602</u>	<u>1,440</u>	<u>1,376</u>	<u>1,511</u>
--	--------------	--------------	--------------	--------------

Funding provides for administrative data processing, including maintenance and periodic replacement of equipment, and operations. The 1984 actual reflects the purchase of computer equipment and a new data base management system in addition to increased maintenance costs. The decrease between the 1985 budget estimate and the 1985 current estimate is due to decreased support service contractor rates and deferral of buildup of systems design analysts. The increase in 1986 is due to anticipated rate increases coupled with the required level of systems analysis effort.

2. <u>Scientific and Technical Information.....</u>	<u>401</u>	<u>742</u>	<u>551</u>	<u>698</u>
---	------------	------------	------------	------------

Included in this activity is the support of the Center's educational programs and public information services. Funding for operation of the Visitor Information Center (VIC), conduct of tours and special events, construction and transport of special exhibits, and related activities are also included. The decrease from the 1985 budget estimate to the 1985 current estimate is the result of a revised VIC exhibit upgrading program. The 1986 budget estimate continues the VIC upgrading program.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>3,350</u>	<u>5,002</u>	<u>4,487</u>	<u>4,352</u>

Summary of Fund Requirements

1. Administrative Communications.....	231	683	476	405
2. Printing and Reproduction.....	---	39	---	---
3. Transportation.. ..	1,614	2,145	1,938	1,886
4. Installation Common Services.....	<u>1,505</u>	<u>2,135</u>	<u>2,073</u>	<u>2,061</u>
Total, Management and Operations.....	<u>3,350</u>	<u>5,002</u>	<u>4,487</u>	<u>4,352</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>231</u>	<u>683</u>	<u>476</u>	<u>405</u>
---	------------	------------	------------	------------

This estimate provides local and long distance telephone service and non-telephone communications. Local telephone service includes the leased lines and equipment to serve the Center population. Non-telephone communications include telex, advanced record system teletype, rapidfax, datafax, teleconference equipment, and oceanic cable service. The 1985 current estimate includes revised rates for local services, FTS services, and a support contract who provides telephone operators. The 1986 decrease is due to the application of the changes required by the President's Management Improvement Initiative.

2. <u>Printing and Reproduction</u> .....	<u>---</u>	<u>39</u>	<u>---</u>	<u>---</u>
---	------------	-----------	------------	------------

This activity provides for administrative printing and copier services. The decrease from the 1985 budget estimate to the 1985 current estimate reflects realignment of the printing function into a larger, more cost effective contract.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Transportation</u> .....	<u>1,614</u>	<u>2,145</u>	<u>1,938</u>	<u>1,886</u>

This activity includes the cost of the support contract for bus, mail and package delivery, stock issuance and administrative aircraft maintenance. It also included moving and hauling services and motor vehicle purchase and maintenance. The decrease from the 1985 budget estimate to the 1985 current estimate is primarily due to decreases in support contractor wage rates. The 1986 budget estimate reflects a reduction due to the application of the changes required by the President's Management Improvement Initiative.

4. <u>Installation Common Services</u> .....	<u>1,505</u>	<u>2,135</u>	<u>2,073</u>	<u>2,061</u>
--	--------------	--------------	--------------	--------------

This funding provides minor administrative services for Center management and staff and administrative recordkeeping at Plum Brook Station. Also included is the cost of staff medical examinations, clinic support, medical supplies and equipment, special x-ray equipment for the in-house occupational health program, and equipment for the physical fitness facility. All of these services are provided by a support contractor. This function also includes funding for maintenance and periodic replacement of administrative equipment and supplies, and postage. The decrease from the 1985 estimate to the 1985 current estimate reflects a decrease in support contractor wage rates. The 1986 budget estimate includes anticipated support contractor rate increases offset by a reduction due to the application of the changes required by the President's Management Improvement Initiative.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
ORGANIZATION AND STAFFING CHART  
LEWIS RESEARCH CENTER

RPM 8-22

STAFFING SUMMARY		
	85	86
SES	20	31
GS 16	1	1
GS 15	115	115
GS 14	204	204
OTHER GS	1524	1519
WAGE GRADE	629	610
TOTAL	2562	2560

DIRECTOR AND STAFF		
	85	86
SES	5	5
GS 16	1	1
GS 15	9	9
GS 14	7	7
OTHER GS	30	30
TOTAL	51	51

<div><div>AERONAUTICS DIRECTORATE</div><div><div>8586</div><div>SES22</div><div>OTHER GS11</div><div>TOTAL33</div></div></div>	<div><div>EROSPACE TECHNOLOGY DIRECTORATE</div><div><div>8586</div><div>S22</div><div>HER GS11</div><div>TOTAL33</div></div></div>	<div><div>SPACE FLIGHT SYSTEMS DIRECTORATE</div><div><div>8586</div><div>SES11</div><div>OTHER GS11</div><div>TOTAL22</div></div></div>	<div><div>SPACE STATION SYSTEMS DIRECTORATE</div><div><div>8586</div><div>SES22</div><div>GS 1522</div><div>OTHER GS11</div><div>TOTAL55</div></div></div>	<div><div>ENGINEERING AND TECHNICAL SERVICES DIRECTORATE</div><div><div>8586</div><div>SES11</div><div>OTHER GS22</div><div>TOTAL33</div></div></div>	<div><div>ADMINISTRATION AND COMPUTER SERVICES DIRECTORATE</div><div><div>8586</div><div>SES11</div><div>GS 1511</div><div>OTHER GS11</div><div>TOTAL33</div></div></div>	<div><div>OFFICE OF THE COMPTROLLER</div><div><div>8586</div><div>SES11</div><div>OTHER GS11</div><div>TOTAL22</div></div></div>
<div><div>ADVANCED PLANNING &amp; ANALYSIS OFFICE</div><div><div>8586</div><div>GS 1533</div><div>GS 1444</div><div>OTHER GS1615</div><div>TOTAL2322</div></div></div>	<div><div>MATERIALS DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 151010</div><div>GS 141414</div><div>OTHER GS7774</div><div>TOTAL10299</div></div></div>	<div><div>ACTS PROJECT OFFICE</div><div><div>8586</div><div>GS 1500</div><div>GS 1444</div><div>OTHER GS2125</div><div>TOTAL2529</div></div></div>	<div><div>POWER SYSTEM PROJECT OFFICE</div><div><div>8586</div><div>SES11</div><div>GS 1533</div><div>GS 1445</div><div>OTHER GS1523</div><div>TOTAL2232</div></div></div>	<div><div>ALTITUDE WIND TUNNEL ENGINEERING OFFICE</div><div><div>8586</div><div>GS 1511</div><div>GS 1433</div><div>OTHER GS1817</div><div>TOTAL2221</div></div></div>	<div><div>MANAGEMENT OFFICE</div><div></div></div>	<div><div>PROGRAM COORDINATION OFFICE</div><div><div>8586</div><div>85%</div><div>GS 1511</div><div>GS 1411</div><div>OTHER GS43</div><div>TOTAL65</div></div></div>
<div><div>INSTRUMENTATION TECHNOLOGY OFFICE</div><div><div>8586</div><div>GS 1533</div><div>GS 1499</div><div>OTHER GS2020</div><div>TOTAL4030</div></div></div>	<div><div>STRUCTURES DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1599</div><div>GS 141515</div><div>OTHER GS5055</div><div>TOTAL8180</div></div></div>	<div><div>SPACE COMMUNICATIONS DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1566</div><div>GS 141010</div><div>OTHER GS5053</div><div>TOTAL8286</div></div></div>	<div><div>POWER SYSTEM ENGINEERING DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1533</div><div>GS 141212</div><div>OTHER GS60103</div><div>TOTAL82119</div></div></div>	<div><div>TEST INSTALLATIONS DIVISION</div><div><div>8586</div><div>GS 1411</div><div>OTHER GS78</div><div>WAGE GRADE300370</div><div>TOTAL308385</div></div></div>	<div><div>OFFICE OF PATENT COUNSEL</div><div><div>8586</div><div>GS 1511</div><div>GS 1422</div><div>OTHER GS11</div><div>TOTAL44</div></div></div>	<div><div>RESOURCES ANALYSIS AND MANAGEMENT OFFICE</div><div><div>8586</div><div>GS 1511</div><div>GS 1444</div><div>OTHER GS1921</div><div>TOTAL2426</div></div></div>
<div><div>INTERNAL FLUID MECHANICS DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1577</div><div>GS 141313</div><div>OTHER GS4730</div><div>TOTAL6050</div></div></div>	<div><div>SPACE PROPULSION TECHNOLOGY DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1533</div><div>GS 141919</div><div>OTHER GS4047</div><div>TOTAL7270</div></div></div>	<div><div>SPACE TRANSPORTATION ENGINEERING DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1555</div><div>GS 141717</div><div>OTHER GS6485</div><div>TOTAL107108</div></div></div>	<div><div>ADVANCED PROGRAMS AND PLANNING OFFICE</div><div><div>8586</div><div>GS 1511</div><div>GS 1444</div><div>OTHER GS1523</div><div>TOTAL2020</div></div></div>	<div><div>FACILITIES OPERATIONS AND MAINTENANCE DIVISION</div><div><div>8586</div><div>GS 1411</div><div>OTHER GS4130</div><div>WAGE GRADE126122</div><div>TOTAL168158</div></div></div>	<div><div>PERSONNEL DIVISION</div><div><div>8586</div><div>GS 1511</div><div>GS 1411</div><div>OTHER GS3637</div><div>TOTAL3839</div></div></div>	<div><div>FINANCIAL MANAGEMENT DIVISION</div><div><div>8586</div><div>GS 1511</div><div>OTHER GS4140</div><div>TOTAL4241</div></div></div>
<div><div>PROPULSION SYSTEMS DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1588</div><div>GS 142020</div><div>OTHER GS7063</div><div>TOTAL107100</div></div></div>	<div><div>POWER TECHNOLOGY DIVISION</div><div><div>8586</div><div>SES1</div><div>GS 142525</div><div>OTHER GS7974</div><div>TOTAL111107</div></div></div>	<div><div>SHUTTLE/CENTAUR PROJECT OFFICE</div><div><div>8586</div><div>SES11</div><div>GS 1533</div><div>GS 1455</div><div>OTHER GS2021</div><div>TOTAL2930</div></div></div>	<div><div>FABRICATION SUPPORT DIVISION</div><div><div>8586</div><div>GS 1411</div><div>OTHER GS2221</div><div>WAGE GRADE106103</div><div>TOTAL129125</div></div></div>	<div><div>COMPUTER SERVICES DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1544</div><div>GS 141313</div><div>OTHER GS111108</div><div>TOTAL129126</div></div></div>	<div><div>PROCUREMENT DIVISION</div><div><div>8586</div><div>GS 1511</div><div>GS 1444</div><div>OTHER GS8485</div><div>TOTAL8990</div></div></div>	
<div><div>AEROPROPULSION FACILITIES AND EXPERIMENTS DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1533</div><div>GS 141411</div><div>OTHER GS5048</div><div>TOTAL7465</div></div></div>	<div><div>SPACE EXPERIMENTS OFFICE</div><div><div>8586</div><div>GS 1544</div><div>GS 1488</div><div>OTHER GS2626</div><div>TOTAL3838</div></div></div>	<div><div>ATLAS/CENTAUR PROJECT OFFICE</div><div><div>8586</div><div>SES11</div><div>GS 1411</div><div>OTHER GS44</div><div>TOTAL66</div></div></div>	<div><div>ENGINEERING DESIGN DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1544</div><div>GS 1466</div><div>OTHER GS5751</div><div>TOTAL6862</div></div></div>	<div><div>HEALTH, SAFETY AND SECURITY DIVISION</div><div><div>8586</div><div>GS 1522</div><div>GS 1422</div><div>OTHER GS5048</div><div>TOTAL5450</div></div></div>		
<div><div>ALTITUDE WIND TUNNEL PROJECT OFFICE</div><div><div>8586</div><div>GS 1533</div><div>GS 1499</div><div>OTHER GS3534</div><div>TOTAL4746</div></div></div>	<div><div>RELIABILITY AND QUALITY ASSURANCE OFFICE</div><div><div>8586</div><div>GS 1511</div><div>GS 141010</div><div>OTHER GS1919</div><div>TOTAL3030</div></div></div>	<div><div>FACILITIES ENGINEERING DIVISION</div><div><div>8586</div><div>SES11</div><div>GS 1544</div><div>GS 1455</div><div>OTHER GS5046</div><div>TOTAL6056</div></div></div>	<div><div>LOGISTICS MGMT. DIVISION</div><div><div>8586</div><div>GS 1411</div><div>OTHER GS4042</div><div>WAGE GRADE11</div><div>TOTAL5044</div></div></div>			
			<div><div>TECHNICAL INFORMATION SERVICES DIVISION</div><div><div>8586</div><div>GS 1411</div><div>OTHER GS4236</div><div>WAGE GRADE66</div><div>TOTAL4943</div></div></div>			

NASA  
HEADQUARTERS

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1986 ESTIMATES

NASA HEADQUARTERS

DESCRIPTION

NASA Headquarters is located at 400 Maryland Avenue, SW, Washington, D.C., and occupies other buildings in the District of Columbia and Maryland.

HEADQUARTERS ROLES AND MISSIONS

The mission of Headquarters is to plan and provide executive guidelines for the implementation of national space and aeronautics programs consistent with the objectives stated in the National Aeronautics and Space Act of 1958, as amended. These objectives are to:

- Extend our knowledge of the Earth, its environment, the solar system, and the universe;
- Expand practical applications of space technology;
- Develop, operate, and improve manned and unmanned space vehicles;
- Improve the civil and military usefulness of aeronautical vehicles, while minimizing their environmental effects and energy consumption;
- Disseminate pertinent findings to potential users; and
- Promote international cooperation in peaceful activities in space.

The following offices at Headquarters assist management in carrying out the technical aspects of the mission:

Office of Space Flight - Plans, directs, executes and evaluates the research, development, acquisition and operation of Space Flight programs. The Space Transportation System has built around the Space Shuttle including its major elements of the orbiters, external tanks, solid rocket boosters and ground systems. The Space Transportation System also includes Upper Stages to put payloads in orbit and trajectory beyond the capability of the orbiter, the Spacelab-related payload carriers and systems such as the Orbital Maneuvering Vehicle. The Office of Space Flight is responsible for development and operation of these systems and their improvement in their performance and cost effectiveness. In addition, the Office is responsible for working

with users of the Space Transportation System, both foreign and domestic, to facilitate the appropriate use of the Space Transportation System. Responsibilities also include development and implementation of appropriate policies for transfer of expendable launch vehicle systems from the Government to the private sector.

Office of Commercial Programs - Plans, directs, executes and evaluates the Technology Utilization program to enhance national economic growth and productivity through the transfer of NASA-developed technology to the non-aerospace sectors of the economy; and the Commercial use of Space program to increase private sector awareness of space opportunities and encourage increased industry investment and participation in high technology space-based research and development. This effort will establish an organizational focal point to initiate a program specifically intended to foster commercial use and access to space.

Office of Space Station - Responsible for the development of the programmatic aspects of the Space Station as they evolve including mission analysis, requirements definition and program management.

Office of Space Science and Applications - Responsible for research and development efforts utilizing a variety of flight system and ground-based observations to increase man's knowledge of the universe. The Earth, Sun, Moon, the planets, interplanetary space, other stars and galaxies, and the interaction among those bodies and systems are all objects of these investigations, as well as assuring medical safety and understanding the basic mechanisms of biological processes using the unique capabilities of the space program. Responsibilities also include conducting research and development activities leading to demonstration and transfer of space-related technology and capabilities which can be effectively applied and used for practical benefits on Earth. These research and development activities involve the following program areas: earth observations, environmental observations, communications, material processing in space, and information systems.

Office of Aeronautics and Space Technology - Plans, directs, executes, and evaluates the aeronautical and space research and technology programs. The aeronautics program develops the technology needed for in safer, more efficient, economical and environmentally acceptable air transportation systems which are responsive to national needs. The space research and technology program provides a technology base which anticipates the technical needs and provides technology options for future space activities. The Office of Aeronautics and Space Technology is also responsible for coordinating the total NASA program of supporting research and technology related to specific programs and projects to insure a comprehensive, properly balanced agency research and technology program.

Office of Space Tracking and Data Systems - Develops, implements, and operates tracking, data acquisition, command, communications, and data processing facilities, systems and services required for support of all NASA flight missions. This office also provides centralized planning and systems management for the administrative communications of NASA installations.

The Headquarters responsibilities include providing a balanced Agency Headquarters workforce capable of:

- Planning, formulating, and advocating executive direction to national programs to implement the objectives stated in the National Aeronautics and Space Act of 1958, as amended.
- Administering, operational and logistical support to those Headquarters elements concerned with carrying out the mission of the National Aeronautics and Space Administration.
- Providing adequate facilities to house the workforce in Washington, D.C.

The Headquarters workforce consists of professional and clerical staff organized into the program offices indicated above and appropriate supporting staff offices. Funding for salaries, travel and necessary support services are included in this portion of the budget submission. Each office is assigned a function consistent with the NASA mission. The number of personnel authorized to an office is determined by management based on the approved personnel ceiling for the Agency and the functions to be performed. The composition of the staff of an office is determined by the head of the office based on the office ceiling and the function to be performed. All personnel are appointed and paid consistent with classification standards established by the Office of Personnel Management. Overall Agency direction is provided by the Administrator, and his personal office staff. The Agency currently has eight installations, and the Jet Propulsion Laboratory, throughout the United States which perform Agency operational missions under direction of the Headquarters staff.

Technical support required by Headquarters is performed primarily by support contractors. Administrative support is provided by the in-house workforce assisted by miscellaneous contract services. Such support includes communications, printing, equipment, transportation, occupational medicine and health, and other administrative support services.



SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan by Function

	1984 <u>Actual</u>	<u>Budget</u> <del>Estimate</del> (Thousands of Dollars)	1985 <u>Current</u> <u>Estimate</u>	1986 <u>Budget</u> <u>Estimate</u>
I. Personnel and Related Cost.....	70,780	71,943	74,396	71,424
11. Travel.....	4,151	4,585	5,156	5,000
III. Operation of Installation.....	33,285	37,085	39,398	40,411
A. Facilities Services.....	(6,859)	(9,752)	(10,183)	(10,027)
B. Technical Services.....	(16,242)	(16,428)	(16,177)	(17,887)
C. Management and Operations .....	<del>(10,184)</del>	<del>(10,905)</del>	<del>(13,038)</del>	<del>(12,497)</del>
Total, fund requirement.....	<u>108,216</u>	<u>112,613</u>	<u>118,950</u>	<u>116,835</u>

Distribution of Permanent Civil Service Workyears

	1984 <u>Actual</u>	1985 <u>Budget Estimate</u>	1985 <u>Current Estimate</u>	1986 <u>Budget Estimate</u>
<del>RESEARCH AND DEVELOPMENT</del> .....	<u>395</u>	<u>390</u>	<u>417</u>	<u>417</u>
Space Station.....	39	<u>25</u>	<u>72</u>	<u>72</u>
Space Transportation Capability Development.....	<u>37</u>	<u>24</u>	<u>24</u>	<u>24</u>
Space Science and Applications .....	<u>200</u>	<u>207</u>	<u>175</u>	<u>175</u>
Physics and astronomy.....	57	59	50	50
Life sciences.....	27	28	24	24
Planetary exploration.....	27	29	24	24
Space applications.....	89	91	77	77
Commercial Programs.....	<u>12</u>	<u>12</u>	<u>36</u>	<u>36</u>
Technology Utilization.....	12	12	12	12
Commercial Use of Space.....	---	---	24	24
Aeronautics and Space Technology .....	<u>104</u>	<u>119</u>	<u>107</u>	<u>107</u>
Aeronautical research and technology.....	62	71	64	64
Space research and technology.....	42	48	43	43
Tracking and Data Advanced Systems .....	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>
<del>SPACE FLIGHT CONTROL AND DATA COMMUNICATIONS</del> .....	<u>177</u>	<u>194</u>	<u>181</u>	<u>181</u>
Shuttle Production and Operational Capability....	20	22	20	20
Space Transportation Operations .....	108	120	112	112
Space and Ground Network Communications and Data Systems.....	49	52	49	49
Subtotal, direct workyears.....	572	584	598	598
<del>CENTER MANAGEMENT AND OPERATIONS SUPPORT</del> .....	<u>755</u>	<u>744</u>	<u>728</u>	<u>694</u>
Total, full-time permanent workyears.....	1,327	1,325	1,326	1,292
Other than full-time permanent workyears.....	<u>127</u>	<u>126</u>	<u>125</u>	<u>125</u>
Total, Permanent Workyears.....	<u>1,454</u>	<u>1,451</u>	<u>1,451</u>	<u>1,417</u>

RESOURCES REQUIREMENTS BY FUNCTION

	1984	<u>1985</u>		1986
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>70,780</u>	<u>71,943</u>	<u>74,396</u>	<u>71,424</u>

Summary of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Full-time <del>permanent</del> .....	57,040	57,547	60,110	57,391
b. Other than full-time <del>permanent</del> .....	2,369	2,623	2,395	2,275
c. Reimbursable <b>detailees</b> .....	458	691	474	461
d. Overtime and other compensation.....	<u>1,480</u>	<u>1,634</u>	<u>1,538</u>	<u>1,536</u>
Subtotal, Compensation.....	61,347	62,495	64,517	61,663

2. <u>Benefits</u> .....	<u>6,771</u>	<u>7,212</u>	<u>7,065</u>	<u>6,809</u>
Subtotal, Compensation & Benefits.....	<u>68,118</u>	<u><del>69,707</del></u>	<u>71,582</u>	<u>68,472</u>

B. Supporting Costs

1. Transfer of <b>personnel</b> .....	84	338	145	165
2. Office of Personnel Management services.....	540	275	781	844
3. Personnel training.....	<u>2,038</u>	<u>1,623</u>	<u>1,888</u>	<u>1,943</u>
Subtotal, Supporting Costs.....	<u>2,662</u>	<u>2,236</u>	<u>2,814</u>	<u><del>2,952</del></u>
Total, Personnel and Related Costs.....	<u>70,780</u>	<u>71,943</u>	<u>74,396</u>	<u>71,424</u>

### Explanation of Fund Requirements

	<u>1984</u>	<u>1985</u>	<u>1986</u>
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>
		(Thousands of Dollars)	
			<u>Budget</u> <u>Estimate</u>
A. <u>Compensation and Benefits</u> .....	<u>68,118</u>	<u>69,707</u>	<u>71,582</u>
1. <u>Compensation</u> .....	<u>61,347</u>	<u>62,495</u>	<u>64,517</u>
a. Full-time permanent.....	57,040	57,547	60,110
			57,391

The increase from the 1985 budget estimate to the 1985 current estimate is due to the 1985 pay raise. The 1986 estimate reflects a reduction due to the application of the changes required by the President's Management Improvement Initiative and the proposed reduction in pay rates.

### Basis of Cost for Permanent Positions

In 1986 the cost of permanent workyears will be \$57,391,000. The decrease from 1985 results from the following:

Cost of full-time permanent workyears in 1985.....	60,110
Cost Increases in 1986.....	2,152
Within-grade and career advances.....	1,414
Full year cost of 1985 actions.....	727
Part year cost of 1986 actions.....	687
Full year cost of 1985 pay raise.....	536
Alteration in the method of calculating salaries paid.....	202
Cost Decreases in 1986.....	-4,871
Turnover savings and abolished positions.....	-792
Full year cost of 1985 actions.....	-256
Part year cost of 1986 actions.....	-536
1986 FTE reduction.....	1,224
Proposed governmentwide salary reduction.....	-2,855
Cost of full-time permanent workyears in 1986.....	57,391

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full-time permanent				
(1) Cost.....	2,369	2,623	2,395	2,275
(2) Workyears.....	150	147	147	147

The distribution of 1986 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Development programs.....	36
Summer employment programs.....	5
Youth opportunity programs.....	22
Other temporary.....	<u>84</u>
<u>Total.....</u>	<u>147</u>

The decrease from the 1985 budget estimate to the 1985 current estimate reflects 1984 experience with the current mix of programs. The 1986 estimate is essentially level with 1985 except for the effects of the proposed 1986 pay reduction.

c. Reimbursable detailees.....	458	691	474	461
--------------------------------	-----	-----	-----	-----

The services of a small group of military officers and civilian detailees from other Government agencies are used by NASA Headquarters where such assignments are of mutual benefit. The decrease from the 1985 budget estimate to the 1985 current estimate is attributable to a reduction in the number of detailees. The 1986 budget estimate reflects essentially a level program from 1985 offset by the proposed 1986 pay reduction.

d. Overtime and other compensation.....	1,480	1,634	1,538	1,536
---	-------	-------	-------	-------

The decrease from the 1985 budget estimate to the 1985 current estimate reflects 1984 experience.

	1984	<u>1985</u>		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. <del>Benefits</del> .....	<u>6,771</u>	<u>7,212</u>	<u>7,065</u>	<u>6,809</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	4,083	4,256	4,300	4,099
Employee life insurance.....	151	177	159	151
Employee health insurance.....	1,273	1,520	1,303	1,291
Workmen's compensation.....	407	483	415	412
FICA.....	126	87	123	117
Medicare.....	581	611	611	582
Other benefits.....	<u>150</u>	<u>78</u>	<u>154</u>	<u>157</u>
Total.....	6,771	7,212	7,065	6,809

The decreases in the 1985 current estimate from the 1985 budget estimate is primarily due to updated pricing of health benefits and workmen's compensation. The 1986 estimate reflects the reduced Headquarters ceiling and the effect of the proposed 1986 pay reduction.

B. <u>Supporting Csts.</u> .....	<u>2,662</u>	<u>2,263</u>	<u>2,814</u>	<u>2,952</u>
1. Transfer of <del>personnel</del> .....	84	338	145	165

The costs associated with transfer of personnel include movement of household goods, subsistence and temporary expenses, real estate and miscellaneous moving expenses related to change of duty station. The decrease from the 1985 budget estimate to the 1985 current estimate reflects a revised number of relocations and 1984 experience. The 1986 estimate reflects essentially the same number of relocations as in 1985.

2. Office of Personnel Management services....	540	275	781	a44
--	-----	-----	-----	-----

Headquarters reimburses the Office of Personnel Management (OPM) for investigation of new hires for the entire Agency. The cost of investigations is a function of two variables, the number of investigations to be conducted, and the unit charge made by the Office of Personnel Management to other agencies. Also included is a payment to OPM for Federal wage system surveys. The increases are driven by new OPM guidelines calling for background investigations on a greater number of employees.

	1984	1985		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. Personnel training.. .....	2,038	1,623	1,888	1,943

The maintenance and expansion of skills is essential in carrying out the Agency's many complex technical programs. Part of the training consists of courses offered by other Government agencies, usually for a fee. The remainder of the training is provided through nongovernment sources. The costs are for tuition, fees and related costs for training at colleges, universities, technical institutions, and for the cost of seminars and workshops in which groups of Headquarters and Field Center employees receive training in subjects of Agencywide interest. The increase from the **1985** budget to the **1985** current estimate reflects the emphasis on the development of the skills of civil service employees in the area of automatic data processing in order to improve efficiency and productivity. The **1986** estimate provides for the same level of training at anticipated cost levels.

	1984	1985		1986
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
<b>II. <u>TRAVEL</u>.....</b>	<b><u>4,151</u></b>	<b><u>4,585</u></b>	<b><u>5,156</u></b>	<b><u>5,000</u></b>

Summary of Fund Requirements

A. Program Travel.....	2,515	2,837	3,408	3,371
B. Scientific and Technical Development Travel.....	411	653	653	676
C. Management and Operations Travel.....	<u>1,225</u>	<u>1,095</u>	<u>1,095</u>	<u>953</u>
Total, Travel.....	<u>4,151</u>	<u>4,585</u>	<u>5,156</u>	<u>5,000</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	2,515	2,837	3,408	3,371
--------------------------------	-------	-------	-------	-------

Program travel funds are used in support of NASA's research and development programs, such as the Space Station, the Space Transportation System, Aeronautics and Space Technology, Space Science and Applications, and other direct research and development programs. This category represents approximately 67 percent of the Headquarters travel requirements for 1986. The increase from the 1985 budget estimate to the 1985 current estimate reflects the cost of implementing the space station program at Headquarters. The 1986 estimate provides for decreased travel in accordance with program plans.

B. <u>Scientific and Technical Development Travel</u> .....	411	653	653	676
---	-----	-----	-----	-----

Scientific and technical development travel permits employees to participate in meetings and seminars with other representatives of the aerospace community. This participation allows personnel to benefit from exposure to technological advances in the field which arise outside NASA, as well as to present both accomplishments and problems to their associates. Many of these meetings are working panels convened to solve certain problems for the benefit of the Government.



	<b>1984</b>	<b>1985</b>		<b>1986</b>
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Management and Operations Travel</u> .....	<b>1,225</b>	<b>1,095</b>	<b>1,095</b>	<b>953</b>

Management and operations travel is for the direction and coordination of general management matters, travel by senior officials to review Center requirements and operations and career development travel in order to broaden the experience of NASA employees. Travel by functional managers in such areas as personnel, financial management, and procurement to assure Agency policies and procedures are being implemented throughout the Agency; local transportation; and Congressional travel. The decrease from the **1985** current estimate to the **1986** estimate reflects a reduction due to the President's Management Improvement Initiative.

---

	1984	<u>1985</u>		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>III <u>OPERATION OF INSTALLATION</u>.....</b>	<b><u>33,285</u></b>	<b><u>37,085</u></b>	<b><u>39,398</u></b>	<b><u>40,411</u></b>

Summary of Fund Requirements

A. Facilities Services.....	6,859	9,752	10,183	10,027
B. Technical Services.....	16,242	16,428	16,177	17,887
C. Management and Operations.....	<u>10,184</u>	<u>10,905</u>	<u>13,038</u>	<u>12,497</u>
Total, Operation of Installation.....	<u>33,285</u>	<u>37,085</u>	<u>39,398</u>	<u>40,411</u>

Explanation of Fund Requirements

Operation of Installation provides a broad range of services, supplies, and equipment in support of the Headquarters' institutional activities. These are divided into three major functional areas: Facilities Services, rental of real property, acquisition, maintenance and repair of institutional facilities and equipment, and the cost of custodial services; Technical Services, the cost of automatic data processing for management activities, and the cost of educational and informational programs and technical shops supporting institutional activities; and Management and Operations, the cost of administrative communications, printing, transportation, medical supplies, and related services.

The increase from the 1985 budget estimate to the 1985 current estimate is due to a combination of new or increased activities primarily for establishment of the Space Station Program Office; enhancement of productivity throughout NASA, contractor and university team; and provision of a higher level of physical security for NASA personnel and property.

A. <u>Facilities Services</u> .. .....	6,859	9,752	10,183	10,027
--	-------	-------	--------	--------

NASA Headquarters is comprised of a complex of buildings in the District of Columbia and Maryland. These are government-owned and leased buildings for which NASA must provide reimbursement to the General Services Administration (GSA) in accordance with P.L. 92-313. The cost of temporary use of off-sight facilities is also included in this category.

Summary of Fund Reirements

		<u>1985</u>		<u>1986</u>
	<u>1984</u>	Budget	Current	Budget
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
1. <u>Rental of Real Property.....</u>	5,690	8,293	8,097	8,074
2. <u>Maintenance and Related Services.....</u>	<del>708</del>	<u>811</u>	<u>1,352</u>	<u>1,192</u>
3. <u>Custodial Services.....</u>	461	<del>648</del>	<u>734</u>	<u>761</u>
Total, Facilities Services.....	6,859	9,752	10,183	10,027

Explanation of Fund Requirements

1. <u>Rental of Real Property..</u>	<del>5,690</del>	<u>8,293</u>	<u>8,097</u>	<u>8,074</u>
-------------------------------------	------------------	--------------	--------------	--------------

Public Law 92-313 requires that agencies be charged for space and related services provided by the General Services Administration at approximate commercial equivalent rates. These funds provide for the cost of office space used by NASA Headquarters personnel. The decrease in the 1985 estimate is due to a reduction in NASA Headquarters office space. 1986 reflects level rental rates as projected by GSA for a slightly lower amount of space rented.

2. <u>Maintenance and Related Services.....</u>	<u>708</u>	<u>811</u>	<u>1,352</u>	<u>1,192</u>
---	------------	------------	--------------	--------------

This estimate provides for facilities maintenance, repair and alterations such as partition changes, auxilliary air conditioning systems for ADP equipment, telephone changes and general building maintenance. The increase in 1985 from the budget estimate is driven by significant maintenance costs incurred by NASA due to the advanced age of Headquarters facilities and the need to upgrade electrical and HVAC systems to facilitate increased utilization of ADP equipment. Some of these upgrade are one-time efforts accomplished in 1985 which causes the decrease from the 1985 current estimate to the 1986 estimate.

3. <u>Custodial Services.....</u>	<u>461</u>	<u>648</u>	<u>734</u>	<u>761</u>
-----------------------------------	------------	------------	------------	------------

These funds cover security guard services in the various Headquarters buildings. They also include reimbursement to GSA for the installation and maintenance of security alarm systems and equipment in the NASA Headquarters buildings. The 1985 current estimate reflects increased rates as projected by GSA and additional security in order to furnish adequate protection for classified defense information, government/personal property, and NASA employees. FY 1986 reflects GSA projected rates.

	1984	1985		1986
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
B. <u>TECHNICAL SERVICES</u> .....	<u>16,242</u>	<u>16,428</u>	<u>16,177</u>	<u>17,887</u>

Summary of Fund Requirements

1. <u>Automated Data Processing</u> .....	<u>12,972</u>	<u>12,818</u>	<u>12,420</u>	<u>13,642</u>
a. <u>Equipment</u> .....	2,162	5,240	2,663	2,902
b. <u>Operations</u> ..	10,810	7,578	9,757	10,740
2. <u>Scientific and Technical In-formation</u> ..	<u>2,580</u>	<u>2,865</u>	<u>2,747</u>	<u>3,188</u>
a. <u>Library</u> .....	392	422	390	418
b. <u>Education and Information</u> .....	2,188	2,443	2,357	2,770
3. <u>Shop and Support Services</u> .....	<u>690</u>	<u>745</u>	<u>1,010</u>	<u>1,057</u>
Total, Technical Services.....	<u>16,242</u>	<u>16,428</u>	<u>16,177</u>	<u>17,887</u>

Explanation of Fund Requirements

1. <u>Automated Data Processing</u> .....	<u>12,972</u>	<u>12,818</u>	<u>12,420</u>	<u>13,642</u>
---	---------------	---------------	---------------	---------------

This estimate provides for the lease, purchase, maintenance, programming and operations services of automatic data processing (ADP) equipment. The small decrease from the 1985 budget to the 1985 current estimate reflects increasing contractor wage rates offset by the effects of one time expenditures in ADP operations accomplished in 1984. The 1986 estimate provides for approximately the same level of services as in 1985 plus some realignment of support contract funding and purchase of essential ADP equipment.

2. <u>Scientific and Technical Information</u> ..	<u>2,580</u>	<u>2,865</u>	<u>2,747</u>	<u>3,188</u>
---	--------------	--------------	--------------	--------------

The activities contained in this subfunction are educational-informational programs and the NASA Headquarters technical library. The education and information programs provide for the gathering and dissemination of information about the Agency's programs to the mass communications media, the general public, and to the educational community at the elementary and secondary levels. Assistance to the mass communications media includes the gathering and exposition of newsworthy material in support of their

requests, and takes such forms as press kits, news releases, television and radio information tapes and clips, and feature material. Research, development, and operational missions in aeronautics and space provide substantive knowledge and serve as an educational stimulus to students and teachers. NASA responds to expressed needs of students by developing curriculum supplements in space-related areas such as physics, biology, chemistry, and math; assistance to over 1,000 teacher workshops and professional education meetings; and participation in science fairs. This program also provides for equal employment opportunity exhibits and films to demonstrate to high schools, colleges and the public the key roles that women and minorities have in the United States space program.

The decrease in the 1985 current estimate from the 1985 budget estimate reflects 1984 experience. The 1986 estimate reflects funding of essentially the same level of contractual services at anticipated contractor wage rates.

	1984	1985		1986
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Shop and Support Services</u> .....	<u><del>600</del></u>	<u>745</u>	<u>1,010</u>	<u>1,057</u>

These funds provide for the continuation of studies on parts applications, NASA-wide safety, reliability, quality assurance standards, graphic and photo processing services. The increase in 1985 over the 1985 budget estimate is to provide for studies relating the improved management and organizational techniques aimed at improving overall Agency productivity. The 1986 estimate provides a continuation of essentially the same level of service provided in 1985 at anticipated rates.

	1984 <u>Actual</u>	<u>1985</u> Budget <u>Estimate</u> (Thousands of Dollars)	Current <u>Estimate</u>	1986 Budget <u>Estimate</u>
C. <u>Management and Operations</u> .....	<u>10,184</u>	<u>10,905</u>	<u>13,038</u>	<u>12,497</u>

Summary of Fund Requirements

1. <u>Administrative Communications</u> .....	2,872	3,386	3,401	3,584
2. <u>Printing and Reproduction</u> .....	1,692	1,528	1,452	1,352
3. <u>Transportation</u> .....	545	661	573	584
4. <u>Installation Common Services</u> .....	<u>5,075</u>	<u>5,330</u>	<u>7,612</u>	<u>6,977</u>
Total, Management and Operations.....	<u>10,184</u>	<u>10,905</u>	<u>13,038</u>	<u>12,497</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>2,872</u>	<u>3,386</u>	<u>3,401</u>	<u>3,584</u>
---	--------------	--------------	--------------	--------------

Included in this category are the costs of leased lines, long distance tolls, telephone exchange services, and other communications. The 1985 and 1986 estimates reflect the expected rate structure changes brought about in the wake of divestiture of AT&T.

2. <u>Printing and Reproduction</u> .....	<u>1,692</u>	<u>1,528</u>	<u>1,452</u>	<u>1,352</u>
---	--------------	--------------	--------------	--------------

Administrative printing includes funds for contractual printing and the related composition and binding operations. This includes services performed by other agencies, chiefly the Government Printing Office, or by commercial printing firms. All common processes of duplicating including photostating, blueprinting, microfilming, and other reproductions are included. The decrease from the 1985 budget estimate to the 1985 current estimate reflects a reduction in the level of printing activity. The 1986 estimate reflects significant effort aimed at reducing administrative costs at NASA Headquarters.

	1984	<u>1985</u>		1986
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Transportation .....</u>	<u>545</u>	<u>661</u>	<u>573</u>	<u>584</u>

Transportation services include rental of trucks, as well as the movement of supplies, materials, equipment and related items. Also included is the cost of operating and maintaining the administrative aircraft which is assigned to the Jet Propulsion Laboratory. The decrease from the 1985 budget estimate to the 1985 current estimate reflects 1984 experience. The increase in the 1986 estimate reflects anticipated increases in costs.

4. <u>Installation Common Services.....</u>	<u>5,075</u>	<u>5,550</u>	<u>7,612</u>	<u>6,977</u>
---	--------------	--------------	--------------	--------------

This function provides for those services which support the Headquarters, such as: patent services, maintenance and repair of office equipment and vehicles; minor Government services; contract histories; trucking and labor services; medical services; contractor incentive awards; Equal Opportunity community relations and fellowships; Administrator's representation allowance; overseas administration support and documentation; and administrative supplies, materials and equipment. The increase in the 1985 current estimate reflects a change in the civil service contractor mix in support services. The decrease in 1986 is a result of the President's Management Improvement Initiative.

# ORGANIZATION AND STAFFING

## NASA HEADQUARTERS

### HEADQUARTERS

#### SUMMARY STAFFING

	FY 85	FY 86
EXCEPTED & SES	228	228
GMIGS 18	1	1
GMIGS 17	1	1
GM/GS 15	301	301
GMIGS 14	210	210
ALL OTHER GM/GS	584	550
WAGE BOARD	8	8
TOTAL PERM	1333	1299

#### ADMINISTRATOR

	FY 85	FY 86
EXCEPTEDISES	12	12
GMIGS 15	—	—
GMIGS 14	—	—
ALL OTHER GM/GS	13	13
WAGE BOARD	—	—
TOTAL PERM	25	25

#### CHIEF SCIENTIST

	FY 85	FY 86
EXCEPTED & SES	3	3
GMIGS 15	—	—
GMIGS 14	—	—
ALLOTHERGMIGS	1	1
WAGE BOARD	—	—
TOTAL PERM	4	4

#### CHIEF ENGINEER

	FY 85	FY 86
EXCEPTED & SES	5	5
GMIGS 15	14	14
GMIGS 14	5	5
ALL OTHER GMIGS	9	9
WAGEBOARD	—	—
TOTAL PERM	33	33

#### SMALL & DISADVANTAGED BUSINESS UTILIZATION

	FY 85	FY 86
EXCEPTED & SES	—	—
GMIGS 15	1	1
GMIGS 14	1	1
ALLOTHERGMIGS	1	1
WAGEBOARD	—	—
TOTAL PERM	3	3

STAFF ADVISORY  
AEROSPACE  
SAFETY ADVISORY PANEL  
PUBLIC AFFAIRS  
INTERNATIONAL AFFAIRS

#### COMPTROLLER

	FY 85	FY 86
EXCEPTED & SES	8	8
GM/GS 15	14	14
GMIGS 14	20	20
ALL OTHER GM/GS	69	69
WAGEBOARD	—	—
TOTAL PERM	111	111

#### GENERAL COUNSEL

	FY 85	FY 86
EXCEPTED & SES	7	7
GMIGS 15	13	13
GMIGS 14	2	2
ALLOTHERGMIGS	15	15
WAGEBOARD	—	—
TOTAL PERM	37	37

#### COMMERCIAL PROGRAMS

	FY 85	FY 86
EXCEPTED & SES	10	10
GM/GS 15	6	6
GMIGS 14	6	6
ALLOTHERGMIGS	17	17
WAGEBOARD	—	—
TOTAL PERM	39	39

#### EXTERNAL RELATIONS

	FY 85	FY 86
EXCEPTED & SES	23	23
GM/GS 15	19	19
GM/GS 14	24	24
ALL OTHER GMIGS	42	42
WAGEBOARD	—	—
TOTAL PERM	108	108

#### MANAGEMENT

	FY 85	FY 86
EXCEPTED & SES	19	19
GMIGS 18	1	1
GMIGS 17	1	1
GMIGS 15	41	41
GMIGS 14	47	47
ALL OTHER GMIGS	168	134
WAGE BOARD	6	6
TOTAL PERM	283	249

#### EQUAL OPPORTUNITY

	FY 85	FY 86
EXCEPTED & SES	4	4
GMIGS 15	2	2
GMIGS 14	3	3
ALLOTHERGMIGS	13	13
WAGEBOARD	—	—
TOTAL PERM	22	22

#### PROCUREMENT

	FY 85	FY 86
EXCEPTEDISES	12	12
GM/GS 15	15	15
GMIGS 14	19	19
ALL OTHER GMIGS	34	34
WAGEBOARD	—	—
TOTAL PERM	80	80

#### LEGISLATIVE AFFAIRS

	FY 85	FY 86
EXCEPTED & SES	3	3
GMIGS 15	5	5
GMIGS 14	2	2
ALLOTHERGMIGS	15	15
WAGE BOARD	1	1
TOTAL PERM	26	26

#### SPACE SCIENCE AND APPLICATIONS

	FY 85	FY 86
GM/GS 15	—	—
GMIGS 14	—	—
ALL OTHER GMIGS	—	—
WAGE BOARD	—	—
TOTAL PERM	175	175

#### AERONAUTICS AND SPACE TECHNOLOGY

	FY 85	FY 86
EXCEPTED & SES	27	27
GMIGS 15	35	35
GMIGS 14	8	8
ALLOTHERGMIGS	37	37
WAGEBOARD	—	—
TOTAL PERM	107	107

#### SPACE FLIGHT

	FY 85	FY 86
EXCEPTED & SES	32	32
GMIGS 15	52	52
GMIGS 14	22	22
ALL OTHER GM/GS	50	50
WAGEBOARD	—	—
TOTAL PERM	156	156

#### SPACE TRACKING AND DATA SYSTEMS

	FY 85	FY 86
EXCEPTED & SES	13	13
GM/GS 15	15	15
GMIGS 14	14	14
ALLOTHERGMIGS	10	10
WAGEBOARD	—	—
TOTAL PERM	52	52

#### SPACE STATION

	FY 85	FY 86
EXCEPTED & SES	13	13
GMIGS 15	8	8
GMIGS 14	14	14
ALLOTHERGMIGS	37	37
WAGEBOARD	—	—
TOTAL PERM	72	72



INSPECTOR  
GENERAL

## **RESEARCH AND PROGRAM MANAGEMENT**

### **FISCAL YEAR 1986 ESTIMATES**

#### **NASA OFFICE OF INSPECTOR GENERAL**

##### **DESCRIPTION**

The NASA Office of Inspector General (OIG) is located at 400 Maryland Avenue, SW, Washington, D.C..  OIG field locations include offices at Ames Research Center, California; Goddard Space Flight Center, Maryland; Jet Propulsion Laboratory, California; Johnson Space Center, Texas; Kennedy Space Center, Florida; Langley Research Center, Virginia; Lewis Research Center, Ohio.  and Marshall Space Flight Center, Alabama.

##### **OFFICE OF INSPECTOR GENERAL ROLES AND MISSIONS**

The NASA OIG was created in 1978 by an Act of Congress (P.L. 95-452) as an independent and objective unit within the Agency.  The purposes and mission of the OIG are to:

- Conduct and supervise audits and investigations relating to NASA's programs and operations;
- Promote economy, efficiency, and effectiveness in the administration of these programs and operations;
- Prevent and detect fraud and abuse in these programs and operations; and
- Keep the NASA Administrator and the Congress fully and currently informed about NASA programs, deficiencies relating to the administration of such programs, and the necessity for and progress of corrective actions.

# SUMMARY OF RESOURCES REQUIREMENTS

## Funding Plan by Function

	1984	1985		1986
	<u>Actual</u>	<u>-Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related <del>Cost</del> .....	4,408	4,752	5,115	5,022
II. <del>Travel</del> .....	209	244	244	252
III. Operation of <del>Installation</del> .....	117	322	519	329
A. Facilities <del>Services</del> .....	(---)	(---)	(---)	(---)
B. Technical <del>Services</del> .....	(47)	(48)	(250)	(50)
C. Management and <del>Operations</del> .....	<u>(70)</u>	<u>(274)</u>	<u>(269)</u>	<u>(279)</u>
Total, fund <del>requirement</del> .....	<u>4,734</u>	<u>5,318</u>	<u>5,878</u>	<u>5,603</u>

Distribution of Permanent Civil Service Workyears

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
Permanent full-time workers.....	90	98	97	97
Other than full-time.....	<u>10</u>	<u>9</u>	<u>10</u>	<u>10</u>
Total workers.....	<u>100</u>	<u>107</u>	<u>107</u>	<u>107</u>

RESOURCES REQUIREMENTS BY FUNCTION

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>4,408</u>	<u>4,752</u>	<u>5,115</u>	<u>5,022</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Full-time <del>permanet</del> .....	3,692	3,637	4,008	3,920
b. Other than full-time <del>permanet</del> .....	153	220	199	194
c. Overtime and other <del>compensation</del> .....	<u>4</u>	<u>4</u>	<u>4</u>	<u>5</u>
Subtotal, <del>Compensation</del> .....	3,849	3,861	4,211	4,119
2. <u>Benefits</u> .....	<u>450</u>	<u>474</u>	<u>487</u>	<u>483</u>
Subtotal, Compensation & <del>Benefits</del> .....	<u>4,299</u>	<u>4,335</u>	<u>4,698</u>	<u>4,602</u>
B. <u>Supporting Costs</u>				
1. Transfer of <del>personel</del> .....	73	375	375	375
2. Personnel <del>training</del> .....	<u>36</u>	<u>42</u>	<u>42</u>	<u>45</u>
Subtotal, Supporting <del>Costs</del> .....	<u>109</u>	<u>417</u>	<u>417</u>	<u>420</u>
Total, Personnel and Related <del>Costs</del> .....	<u>4,408</u>	<u>4,752</u>	<u>5,115</u>	<u>5,022</u>

Explanation of Fund Requirements

	1984 <u>Actual</u>	<u>1985</u> Budget      Current <u>Estimate</u> <u>Estimate</u>	1986 Budget <u>Estimate</u>
		(Thousands of Dollars)	
A. <u>Compensation and Benefits</u> .....	<u>4,299</u>	<u>4,335</u> <u>4,698</u>	<u>4,602</u>
1. <u>Compensation</u> .....	<u>3,849</u>	<u>3,861</u> <u>4,211</u>	<u>4,119</u>
a. Full-time <del>permanet</del> .....	3,692	3,637      4,008	3,920

Basis of Cost for Permanent Positions

In 1986 the cost of permanent workyears will be \$3,920,000.      The decrease from 1985 results from the following:

Cost of full-time permanent workyears in 1985.....	4,008
Cost Increases in 1986.....	158
Within-grade and career <del>advances</del> .....	104
Full year cost of 1985 <del>actions</del> .....	54
Part year cost of 1986 <del>actions</del> .....	50
Full year cost of 1985 pay <del>raise</del> .....	41
Alteration in the method of calculating salaries paid.....	13
Cost Decreases in 1986.....	-246
Turnover savings and abolished <del>positions</del> .....	-56
Full year cost of 1985 <del>actions</del> .....	-27
Part year cost of 1986 <del>actions</del> .....	-29
Proposed governmentwide salary <del>reduction</del> .....	-190
Cost of full-time permanent workyears in 1986.....	3,920

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full-time permanent				
(1) <del>cost</del> .....	153	220	199	194
(2) <del>workyears</del> .....	10	9	10	10

The distribution of 1986 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Summer employment <del>programs</del> .....	1
Other <del>temporary</del> .....	<del>0</del>
Total.....	<del>10</del>

The 1986 estimate is essentially level with 1985 except for the effects of the proposed 1986 pay reduction.

c. Overtime and other compensation.....	4	4	4	5
2. <del>Benefits</del> .....	<del>450</del>	<del>474</del>	<del>487</del>	<u>483</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	269	276	294	288
Employee life insurance.....	10	11	11	11
Employee health insurance.....	85	100	90	91
Workmen's compensation.....	31	36	33	33
FICA.. ..	10	11	17	18
Medicare.....	38	40	42	42
Other <del>benefits</del> .....	<u>7</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>
Total.....	450	474	487	483

The decrease in the 1986 estimate from the 1985 current estimate is primarily due to retirement fund contributions linked to the proposed 1986 pay reduction.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
B. <u>Supporting Costs</u> .....	<u>109</u>	<u>417</u>	<u>417</u>	<u>420</u>
1. Transfer of personnel.....	73	375	375	375

The costs associated with transfer of personnel include movement of household goods, subsistence and temporary expenses, real estate and miscellaneous moving expenses related to change of duty station. The 1986 estimate reflects essentially the same number of relocations as in FY 1985.

2. Personnel training.....	36	42	42	45
----------------------------	----	----	----	----

The maintenance and expansion of skills is essential in carrying out the Inspector General's Mission. Part of the training consists of courses offered by other Government agencies, usually for a fee. The remainder of the training is provided through nongovernment sources. The costs are for tuition, fees and related costs for training at colleges, universities, technical institutions, and for the cost of seminars and workshops. The 1986 estimate provides for the same level of training as FY 1985 at anticipated cost levels.

---



	1984 <u>Actual</u>	<u>1985</u>		1986
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
II. <u>Travel</u>	<u>209</u>	<u>244</u>	<u>244</u>	<u>252</u>

Summary of Fund Requirements

Management and Operations Travel.....	<u>209</u>	<u>244</u>	<u>244</u>	<u>252</u>
Total, Travel.....	<u>209</u>	<u>244</u>	<u>244</u>	<u>252</u>

Explanation of Fund Requirements

<u>Management and Operations Travel.....</u>	209	244	244	252
--	-----	-----	-----	-----

Travel funding is required to carry out audits, investigation and management duties. The FY 1986 costs represent the same level of travel as in FY 1985.

	1984 <u>Actual</u>	1985		1986
		Budget <u>Estimate</u> (Thousands of Dollars)	Current <u>Estimate</u>	Budget <u>Estimate</u>
III. <u>OPERATION OF INSTALLATION</u> .....	<u>117</u>	<u>322</u>	<u>519</u>	<u>329</u>
<u>Summary of Fund Requirements</u>				
Technical Services.....	7	48	250	50
Management and Operations.	<u>70</u>	<u>274</u>	<u>269</u>	<u>279</u>
Total, Operation of Installation.	<u>117</u>	<u>322</u>	<u>519</u>	<u>329</u>

Explanation of Fund Requirements

Operation of Installation provides a broad range of services, supplies, and equipment in support of the Inspector General's activities.

The decrease from the 1985 current estimate to the 1986 estimate is due to a one time purchase of ADP software for automation of the Inspector General's Audit Operations which is also reflected in the increase from the 1985 budget estimate to the 1985 current estimate.

	1984	1985		1986
	Actual	Budget	Current	Budget
		Estimate	Estimate	Estimate
		(Thousands of Dollars)		
B. <u>Technical Services</u> .....	<u>47</u>	<u>48</u>	<u>250</u>	<u>50</u>

Summary of Fund Requirements

1. <u>Automated Data Processing</u> .....	<u>47</u>	<u>48</u>	<u>250</u>	<u>50</u>
<u>Operations</u> .....	47	48	250	50
Total, Technical Services.....	<del>47</del>	<u>48</u>	<u>250</u>	<del>50</del>

Explanation of Fund Requirements

1. <u>Automated Data Processing</u> .....	<u>47</u>	<u>48</u>	<u>250</u>	<u>50</u>
---	-----------	-----------	------------	-----------

This estimate provides for the lease, purchase, maintenance, programming and operations services of automated data processing (ADP) equipment. The decrease from the 1985 budget to the 1986 estimate reflects one time expenditures in ADP operations in 1985.

C. <u>Management and Operations</u> .....	<u>70</u>	<u>274</u>	<u>269</u>	<u>279</u>
---	-----------	------------	------------	------------

Summary of Fund Requirements

1. <u>Administrative Communications</u> .....	20	21	21	21
2. <u>Printing and Reproduction</u> .....	2	2	2	2
3. <u>Installation Common Services</u> .....	<u>48</u>	<u>251</u>	<u>246</u>	<u>256</u>
Total, Management and Operations.. ..	<del>70</del>	<u>274</u>	<u>269</u>	<u>279</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<del>20</del>	<u>21</u>	<u>21</u>	<u>21</u>
---	---------------	-----------	-----------	-----------

Included in this category are the costs of local telephone services for the Inspector General's office at NASA Headquarters.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2 <u>Printing and Reproduction.....</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>

Costs of printing and reproduction services used by the Office of Inspector General at NASA Headquarters are included

3 <u>Installation Common Services.....</u>	<u>48</u>	<u>251</u>	<u>246</u>	<u>256</u>
--	-----------	------------	------------	------------

The Inspector General's direct use of administrative supplies, materials and equipment is covered in this subcategory.

# INSPECTOR GENERAL SUMMARY

	<u>FY 85</u>	<u>FY 86</u>
EXCEPTED & SES	6	6
GMIGS-15	10	10
GMIGS-14	14	14
ALL OTHER GMIGS	72	72
<b>TOTAL</b>	<b>102</b>	<b>102</b>

## OKGANIZATION AND STAFFING Office of Inspector General

# INSPECTOR GENERAL DEPUTY INSPECTOR GENERAL

	<u>FY 85</u>	<u>FY 86</u>
EXCEPTED & SES	2	2
GM/GS-15	1	1
GMIGS-14	0	0
ALL OTHER GMIGS	1	1
<b>TOTAL</b>	<b>4</b>	<b>4</b>

## ASSISTANT INSPECTOR GENERAL FOR AUDITING

	<u>FY 85</u>	<u>FY 86</u>
EXCEPTED & SES	1	1
GMIGS-15	1	1
GMIGS-14	2	2
ALL OTHER GMIGS	1	1
<b>TOTAL</b>	<b>5</b>	<b>5</b>

## ASSISTANT INSPECTOR GENERAL FOR INVESTIGATIONS

	<u>FY 85</u>	<u>FY 86</u>
EXCEPTED & SES	1	1
GM/GS-15	1	1
GMIGS-14	0	0
ALL OTHER GMIGS	1	1
<b>TOTAL</b>	<b>3</b>	<b>3</b>

## ASSISTANT INSPECTOR GENERAL FOR MANAGEMENT SERVICES

	<u>FY 85</u>	<u>FY 86</u>
EXCEPTED & SES	1	1
GMIGS-15	1	1
GMIGS-14	2	2
ALL OTHER GMIGS	4	4
<b>TOTAL</b>	<b>8</b>	<b>8</b>

## ASSISTANT INSPECTOR GENERAL FOR TECHNICAL SERVICES

	<u>FY 85</u>	<u>FY 86</u>
EXCEPTED & SES	1	1
GMIGS-15	2	2
GMIGS-14	2	2
ALL OTHER GMIGS	6	6
<b>TOTAL</b>	<b>11</b>	<b>11</b>

# CENTER OIG OFFICES

	<u>FY 85</u>	<u>FY 86</u>
EXCEPTED & SES	0	0
GMIGS-15	4	5
GMIGS-14	9	8
ALL OTHER GMIGS	58	58
<b>TOTAL</b>	<b>71</b>	<b>71</b>

SPECIAL  
ANALYSES

## RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1986

### JET PROPULSION LABORATORY

#### DESCRIPTION

The Jet Propulsion Laboratory (JPL) is located in Pasadena, California, approximately 20 miles north of downtown Los Angeles with subsidiary facilities located at Goldstone, California (tracking and data acquisition), Edwards Air Force Base, California (propellant formulation and testing), and Table Mountain, California, (open air testing and astronomy).

At Pasadena, the Laboratory occupies 176 acres of land of which 156 acres are owned by NASA and 20 acres are leased. At Goldstone, facilities are located on land occupied under permit from the Army. At Edwards Air Force Base, facilities are located on land occupied under permit from the Air Force. The facilities at Table Mountain are located on land occupied under permit from the Forest Service of the Department of Agriculture. The capital investment of the Jet Propulsion Laboratory, including the Deep Space Network, fixed assets in progress, and contractor-held facilities, as of September 30, 1984, was \$520,061,000.

The Jet Propulsion Laboratory is a Government-owned installation that is staffed and managed by the California Institute of Technology. Contract NAS7-918 between NASA and Caltech governs research, development, and related activities at the Laboratory with facilities being provided under a separate facilities contract **NAS7-270(F)**. The cost of operating JPL for NASA activities is borne by the Research and Development and Space Flight, Control and Data Communications appropriations, except for the lease or purchase of administrative aircraft and the purchase of passenger motor vehicles, which are funded from the Research and Program Management appropriation and are included in the NASA Headquarters budget. Accordingly, the Research and Program Management costs presented in this special analysis for JPL are for purposes of comparison only and are not a part of the NASA Research and Program Management budget.

## ROLES AND MISSIONS

The Jet Propulsion Laboratory is primarily responsible for the conduct of NASA automated missions concerned with scientific exploration of the solar system and deep space; spacecraft tracking and data acquisition, research and analysis required by deep space flight; and for the development of advanced spacecraft technologies including propulsion, guidance and control systems, electronics, and others. The Laboratory is also assigned responsibility for selected automated Earth-orbital projects and the development of earth remote sensing instruments, research & analysis associated with the development and application of remote sensing technology. Implicit in these assignments is a broad range of engineering, scientific, and management functions devoted to:

1. The conduct of complete spaceflight projects, including overall project management and all phases of project activity beginning with mission design and following with spacecraft design, development, testing, flight operations, and data analysis.
2. The development and operation of the Deep Space Network which provides tracking and data acquisition services for all NASA projects involving missions beyond near-Earth orbits.
3. Continuing programs of scientific investigation, and research and analysis.

In more specific terms, the principal Laboratory activities in support of NASA can be categorized as follows:

**Planetary Exploration** - Since the beginning of the Nation's space activities, JPL has devoted a major part of its efforts to exploration of the planets, their satellites, and the interplanetary medium. The Laboratory has had project management responsibility for all of the Mariner missions, including design, fabrication, assembly and testing of the spacecraft. For two decades, beginning with the Mariner 2 flight to Venus in 1962, these missions have provided an enormous scientific return. The two most recently completed missions in the Mariner series are those of Mariner-9, which returned scientific data for nearly a year from a Martian orbit, and Mariner-10, which gathered data in a close flyby of Venus followed by three separate encounters with Mercury.

The Jet Propulsion Laboratory was a major participant in the Viking project, carrying out, among other assignments, the development of the two orbiters which reached Mars during the summer of 1976. The Viking mission operations were repeatedly extended as the spacecraft far out-lived their design lifetimes. In 1983 operations were completed when Viking Lander I ceased functioning after several years of transmitting important scientific information from the surface of Mars.

In the continuing series of planetary missions, JPL has management responsibility for the Voyager mission. Two Voyager spacecraft were launched in 1977 and made close flybys of Jupiter and its major



satellites in **1979**. In **1980** and **1981** the Voyager spacecraft encountered Saturn. The Voyager planetary encounters obtained exceptionally unique scientific data. Voyager 2 is now enroute to Uranus for a flyby in **1986** after which it will continue on to Neptune with an arrival at the planet in **1989**. Meanwhile, Voyager 1 continues to collect and transmit data on the interplanetary space environment as it proceeds out of the solar system.

The Laboratory also has project management responsibility for the Galileo mission, which is planned to orbit Jupiter and send an instrumented probe into the planet's atmosphere. The probe will make direct measurements of the physical and chemical properties of the Jovian atmosphere. During its in-orbit lifetime of 22 months, the orbiter will observe Jupiter and its system of satellites at close range. An option is being retained to provide an encounter with the asteroid amphi-trite enroute to Jupiter. JPL is the management center for the total project (orbiter and probe) and is developing the orbiter in-house. The Ames Research Center is responsible for the probe development. The mission is scheduled for launch in **1986**.

The Ulysses Project (formerly named International Solar Polar Mission) is a cooperative effort between NASA and the European Space Agency (ESA) to study the Sun at high solar latitudes. JPL is managing United States principal investigator instrument development, to fly on the ESA spacecraft plus the data analysis. In addition, JPL is providing mission support to ESA. ESA is developing the spacecraft and a set of its own instruments.

The Venus Radar Mapper (VRM) mission, initiated in FY **1984**, will obtain high resolution global radar imagery and altimetric and gravity data. The objectives are to address fundamental questions regarding the origin and evolution of the planet. The primary data gathering period will extend over one Venusian year equal to **243** Earth days. JPL is managing the project, including responsibility for mission design and operations, and has contracted with industry for the development of the spacecraft and synthetic aperture radar. The mission will be launched in **1988**.

Development of the Mars Observer (formerly named Mars Geoscience/Climatology Orbiter) will be initiated in FY **1985** leading to a launch in **1990**. The mission will undertake global studies of the composition and physical state of Martian materials, study their major surface forming processes and their time scales, and explore the structure and circulation aspects of the atmosphere. The Jet Propulsion Laboratory is the management center with responsibility for scientific payload, and will contract with industry for development of the spacecraft bus.

Physics and Astronomy - Consistent with its role as a center for Earth-orbital spacecraft development, JPL managed the Infrared Astronomical Satellite (IRAS) project. IRAS was launched in **1983**. This was a cooperative mission with the Netherlands and the United Kingdom. The spacecraft portion of the satellite was designed and built in the Netherlands; JPL was responsible for the infrared telescope development and system testing activities and data analysis. Flight operations were completed in November **1983**. IRAS has been a highly successful scientific undertaking and the analysis of the enormous quantity of data obtained will continue for many years.

In the Space Applications program JPL is a principal Center for work in oceanographic applications of space technology, as well as microgravity experimentation. The Laboratory also conducts significant activities in upper atmospheric research; in development and implementation of remote sensing techniques for Earth resources observations; and in geodynamics and plate tectonics research. Flight experiments for microgravity research in glasses and fluid dynamics will also be developed.

JPL is also managing an atmospheric science satellite, the Solar Mesosphere Explorer, which was launched on October 6, **1981**, into a Sun-synchronous polar orbit. The spacecraft module was developed under a JPL contract with private industry, and five science instruments were developed by the Laboratory for Atmospheric and Space Physics at the University of Colorado.

The Jet Propulsion Laboratory is responsible for the design, development, maintenance, and operation of NASA's world-wide Deep Space Network (DSN) and a Mission Control and Computing Center. The DSN tracking stations are located in California, Spain, and Australia, and support projects involving flights beyond near-Earth orbit. The Mission Control and Computing Center, located at JPL, is the location of actual day-to-day operations of deep-space missions such as Voyager. JPL is also implementing the Network Consolidation program which will co-locate the residual Space Tracking and Data Network (STDN) near-Earth tracking stations with the three DSN stations. These consolidated facilities will be managed by JPL and will provide a more efficient, technically advanced and cost effective means of operations by the mid **1980's**.

**Research and Analysis area** - JPL maintains an effective program of advanced technical development to provide sound technologies for present and prospective project assignments and to further the general capabilities of NASA. Areas of involvement include spacecraft advanced development, autonomous systems, space power and propulsion systems, electronics, information systems, and basic research in such fields as fluid physics, polymer materials and applied mathematics. The Laboratory participates in scientific experiments on both JPL-managed and non-JPL-managed flight projects. This participation includes, not only the performance of scientific investigations, but also a significant commitment to the development of scientific instruments for use in space missions. Ground-based research programs are carried out in the planetary sciences, physics and astronomy, Earth and ocean physics and microgravity. These activities involve broad collaboration with the scientific and academic communities and with staff members from other NASA field installations.

Simulated Research and Program Management Budget

Funding Plan by Function

	1984	<u>1985</u>		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	168,764	182,472	181,327	182,683
II. Travel.....	7,378	6,779	7,991	8,016
III. Operation of Installation.....	46,019	40,544	49,795	54,485
A. Facilities Services.....	(24,975)	(23,128)	(26,663)	(29,604)
B. Technical Services.....	(6,622)	(6,084)	(7,040)	(7,503)
C. Management and Operations.....		<u>(11,332)</u>	<u>(16,092)</u>	<u>(17,378)</u>
Total, fund requirements.....		<u>229,795</u>	<u>239,113</u>	<u>245,184</u>

EXPLANATION OF FUND REQUIREMENTS

<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>168,764</u></b>	<b><u>182,472</u></b>	<b><u>181,327</u></b>	<b><u>182,683</u></b>
---	-----------------------	-----------------------	-----------------------	-----------------------

The decrease from the 1985 budget estimate to the 1985 current estimate is due to a reassessment of reimbursable activity based on actual experience and provides for the October 1, 1985 pay raise and increases in associated employee benefits. The increase from the 1985 current estimate to the 1986 estimate is due to the projected increase in workforce and anticipated higher costs of personnel benefits, such as health insurance and retirement costs and social security contributions.

<b>II. <u>Travel</u>.....</b>	<b><u>7,378</u></b>	<b><u>6,779</u></b>	<b><u>7,991</u></b>	<b><u>8,016</u></b>
-------------------------------	---------------------	---------------------	---------------------	---------------------

The increase from the 1985 budget to the 1985 current estimate reflects the increased travel costs experienced in 1984 and an increase in personnel.

	1984	1985		1986
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>III. OPERATION OF INSTALLATION.....</b>	<b><u>46,019</u></b>	<b><u>40,544</u></b>	<b><u>49,795</u></b>	<b><u>54,485</u></b>
A. Facilities Services.....	24,975	23,128	26,663	29,604

The increase from the 1985 budget estimate to the 1985 current estimate primarily results from unanticipated increases in lease costs of buildings and the filling of backlogged equipment requirements. The increase from the 1985 current estimate to the 1986 estimate is due to interest payments to Caltech related to the engineering support facility being constructed at JPL and anticipated inflationary increases.

B. Technical Services.....	6,622	6,084	7,040	7,503
----------------------------	-------	-------	-------	-------

The increase from the 1985 budget estimate to the current estimate reflects the level of engineering services, quality assurance and technical services required to support the expanded operations associated with increased activity at the Lab. The increase from 1985 to 1986 is primarily attributable to anticipated increases in the costs of services.

C. Management and Operations.....	14,422	11,332	16,092	17,378
-----------------------------------	--------	--------	--------	--------

The increase from the 1985 budget estimate to the 1985 current estimate reflects the 1984 experience and increased supplies and materials and equipment related to growth in Lab. activity. The increase from 1985 to 1986 is primarily attributable to anticipated cost increases resulting from telephone service divestiture.

DISTRIBUTION OF PERMANENT WORKYEARS BY PROGRAM

	1984	1985		1986
	<u>Actual</u>	<u>Budget- Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
<u>RESEARCH AND DEVELOPMENT.....</u>	<u>1,653</u>	<u>1,587</u>	<u>1,646</u>	<u>1,532</u>
<u>Space Transportation Capability Development.....</u>	<u>11</u>	<u>15</u>	<u>24</u>	<u>26</u>
<u>Space - - - - -</u>	<u>1,354</u>	<u>1,326</u>	<u>1,341</u>	<u>-</u>
Physics and astronomy.....	169	101	148	135
Life sciences.....	16	21	19	17
Planetary exploration.....	799	832	824	735
Space Applications.....	370	372	350	344
<u>Commercial Programs</u>				
Technology Utilization .....	<u>3</u>	<u>3</u>	<u>4</u>	<u>4</u>
<u>Aeronautics and Space Technology.....</u>	<u>209</u>	<u>161</u>	<u>105</u>	<u>189</u>
Aerotics.....	3	3	0	0
Space.....	206	158	195	189
<u>Tracking and Data Advanced Systems.....</u>	<u>76</u>	<u>82</u>	<u>82</u>	<u>82</u>
<u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS.....</u>	<u>434</u>	<u>433</u>	<u>421</u>	<u>408</u>
Shuttle Production and Operation Capability.....	6	6	8	7
Space and Ground Network Communication and Data Systems.....	428	427	413	401
Subtotal, direct workyears.....	2,087	2,020	2,067	1,940
<u>DIRECT SUPPORT.....</u>	<u>451</u>	<u>438</u>	<u>474</u>	<u>444</u>
<u>CENTER MANAGEMENT AND OPERATIONS.....</u>	<u>1,018</u>	<u>999</u>	<u>1,075</u>	<u>1,006</u>
Total, permanent workyears.....	<u>3,556</u>	<u>3,457</u>	<u>3,616</u>	<u>3,390</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1986 **ESTIMATES**

SUMMARY OF AERONAUTICAL RESEARCH AND TECHNOLOGY

OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY

	1984	1985		1986
	<u>Actual</u>	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
Research and development.....	315,300	342,400	342,400	354,000
Construction of facilities.....	24,000	30,300	25,300	13,100
Research and program management.....	<u>257,700</u>	<u>314,400</u>	<u>265,600</u>	<u>255,000</u>
Total.....	<u>597,000</u>	<u>687,100</u>	<u>633,300</u>	<u>622,100</u>

Number of direct workyears associated with aeronautical research and technology..	3,745	3,762	3,621	3,561
--	-------	-------	-------	-------

The objective of the aeronautical research and technology program is to conduct an effective and productive program that contributes materially to the preeminence of U.S. civil and military aviation by: (1) conducting appropriate levels of disciplinary and systems research at the leading edge of technology in those areas critical to the continued superiority of U.S. aircraft; (2) maintaining the research centers in positions of excellence in facilities and technical staff; (3) assuring timely transfer of research results to the U.S. aeronautical industry; (4) assuring appropriate involvement of universities and industry; and (5) providing aeronautical development support to other government agencies and U.S. industry. Conducted well in advance of and independent of specific applications, the aeronautical research and technology program includes both fundamental research in the aeronautical disciplines and systems research directed at interaction among disciplines, components, and subsystems applicable to general classes of advanced military and civil aircraft. The program involves participation by aeronautical manufacturers from the industrial base essential to both military and civil aviation to ensure that the technology is compatible with practical design considerations and can be successfully transferred into application.

The **1986** estimate reflects the need to continue efforts both in the basic aeronautical disciplines and in areas of systems research; maintain specialized facilities essential to aeronautical research; and undertake systems technology efforts of high potential payoff to the nation.

The research and technology base program includes disciplinary research which is applicable to all classes of aircraft (such as general aviation, transports, rotorcraft and hypersonic and other high-performance aircraft), as well as the disciplinary research which is unique to any of these classes of aircraft. The systems technology programs are more focused in applications and/or have the characteristics of specific projects (such as advanced turboprop systems and oblique wing technology). Funding for the operation of wind tunnels, propulsion facilities, simulators, and flight research operations is covered in the most appropriate disciplinary elements of the research and technology base. A summary of some of the major thrusts for both the research and technology base and systems technology programs follows.

Fluid and thermal physics research will increase emphasis on computational fluid mechanics for internal turbomachinery flows and will initially focus on scaling and modeling three-dimensional end-wall boundary layers. In applied aerodynamics, research on drag reduction techniques, such as laminar flow control, large eddy break-up devices and riblets which hold the potential for significantly reducing drag, will be carried through larger scale wind tunnel tests and flight evaluation.

Areas of emphasis in materials and structures will include advanced powder metallurgy aluminum alloys and damage-tolerant polymeric composites. Increased emphasis will be directed to computational structural mechanics to enable improved analysis of complex aircraft structures. Systems technology efforts in ceramics and turbine engine hot section technology will continue toward achievement of higher engine operating temperatures for significant increases in durability and efficiency.

In the controls and guidance and human factors areas, research emphasis will continue on flying qualities for highly controls-augmented aircraft, working closely with the Federal Aviation Administration (FAA) in integration of airborne capabilities that will support the national airspace modernization, validation methodology for fault-tolerant systems and human factors of advanced crew station automation.

In information sciences, the major emphasis will be on research and evaluation of parallel architecture machines for computational fluid dynamics and computational structural mechanics applications through cooperative efforts with the evaluation of an experimental high-speed network to provide remote user access.

Rotorcraft systems technology efforts will include the detailed design and fabrication of an x-wing rotor system in preparation for flight testing on the rotor systems research aircraft.

Areas of continued emphasis in high-performance aircraft research will include high angle-of-attack flight, vertical thrust and short takeoff/vertical landing, supersonic cruise/maneuverable aircraft, integrated propulsion/flight control, mission adaptive wing and forward swept wing. The oblique wing research aircraft program with the Navy will continue with the redesign and modification of NASA's F-8 aircraft. Flight test is planned to begin in 1988. Continuing research efforts will address hypersonic propulsion, structures and configuration aerodynamics and integration. Additional emphasis in this area will address the technology for an air turboramjet propulsion system for future hypersonic aircraft.

In the advanced turboprop program, the large-scale single-rotation propellers will be integrated into a flight-weight propulsion system for static propeller tests and low-speed wind tunnel integration tests in 1986 leading to a full-scale flight test in 1987 in order to make this technology available for next-generation commercial transport/cargo aircraft. The large-scale proof-of-concept testing of the unducted fan will also be completed. The general aviation/commuter engine technology program will concentrate on multifueled rotary engines. The propulsion and power research and technology program has been restructured to focus on technologies for integrated systems and specific vehicle applications.

In the numerical aerodynamic simulation program, the processing system network development will lead to completion of the initial operating configuration in 1986. The acquisition of the second high-speed processor for the extended operating configuration will be initiated for delivery in 1987.

The construction of facilities program for 1986, in support of aeronautical research and technology, includes modifications to the Langley Research Center 16-foot transonic tunnel for airframe/propulsion integration research and funding to enable completion of the numerical aerodynamic simulation (NAS) facility, as proposed in 1985, including a secure data processing area.

The research and program management funding in 1986 provides for the salaries and travel of 3,561 direct civil service workyears, for the utilities necessary to conduct wind tunnel operations, and for other general operation of installation costs necessary to conduct the NASA aeronautics program.



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RESEARCH AND DEVELOPMENT

ESTIMATED FY 1986 OBLIGATIONS FOR EQUIPMENT TO BE PLACED AT NASA INSTALLATIONS

<u>Program Budget Line Item</u>	1986 (Thousands of Dollars)
<u>Research and Development</u> . . . . .	<u>110,197</u>
Space Transportation Capability Development . . . . .	(45,726)
Space Station . . . . .	(10,900)
Physics and Astronomy . . . . .	(5,320)
Planetary Exploration . . . . .	(1,111)
Life Sciences . . . . .	(0)
Space Applications . . . . .	(6,302)
Technology Utilization . . . . .	(0)
Aeronautical Research and Technology . . . . .	(38,351)
Space Research and Technology . . . . .	(2,487)
Tracking and Data Acquisition (R&D) . . . . .	(0)
<u>Space Flight, Control and Data Communications</u> . . . . .	<u>91,323</u>
Shuttle Production and Capability Development . . . . .	(59,645)
Space Transportation Operations . . . . .	(15,437)
Expendable Launch Vehicles . . . . .	(441)
Space and Ground Networks, Communication and Data Systems . . . . .	(15,800)
 <u>GRAND TOTAL</u> . . . . .	 <u><u>201,520</u></u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS.)
Space Transportation Capability Development	Johnson Space Center, Location 7201-AA; 86-010060	Category III Workstation	Supports data system and flight operations.	1,289
Space Transportation Capability Development	Johnson Space Center, Location 7201-AA, 86-010445	Disk Systems	Supports data system and flight operations.	721
Space Transportation Capability Development	Johnson Space Center, Location 7201-AA, 86-010460	Permanent File System	Supports data system and flight operations.	900
Space Transportation Capability Development	Johnson Space Center, Location 7201-AA, 86-010465	Central Computer Facility Augmentation	Supports data system and flight operations.	1,221
Space Transportation Capability Development	Johnson Space Center, Location 7201-AA, 86-010495	Non-Secure 1100 Systems	Supports data system and flight operations.	2,008
Space Transportation Capability Development	Johnson Space Center, Location 7201-AE, 86-010495	Information System Computer	Supports data system and flight operations.	1,920
Space Transportation Capability Development	Johnson Space Center, Location 72222-XX, 86-010075	VAX Array	Supports research and test operations.	512

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS.)
Space Transportation Capability Development	Johnson Space Center, Location 7234-XX, 86-010235	Crew System Laboratory Direct Access Storage Disk Replacement	Supports research and test operations.	950
Space Transportation Capability Development	Johnson Space Center, Location 7256-XX, 86-010405	Engineering Systems Laboratory Computer	Supports research and test operations.	962
Space Transportation Capability Development	Johnson Space Center, White Sands Test Facility, Location 7258-AN, 86-010115	Program Support Computer System	Supports operations support.	500
Space Transportation Capability Development	Johnson Space Center, Location 7265-XX, 86-010120	Engineering Directorate 11/750 VAX	Supports research and test operations.	25
Space Transportation Capability Development	Kennedy Space Center, Location 7603-P7, 86-005080	Interactive Graph System	Supports launch systems operations.	200
Space Transportation Capability Development	Kennedy Space Center, Pad A, Pad B, and XY Bldg., 76-86-02	Remote Payload Data Circuit Switchers	Provides rapid switching capability and better control of payload circuits.	831
Space Transportation Capability Development	Marshall Space Flight Center, Location 6201-01, 86-003935	Engineering and Data Systems Class VI Computer	Supports research and test operations.	9,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS. )
Space Station	Johnson Space Center, Location 72001-AA, 86-101390	Central Computer Facility Space Station Processors	Supports utilization.	1,087
Space Station	Johnson Space Center, Location 7283-NN, 86-010145	Space Station Management Communications and Data System	Supports system definition.	3,077
Space Station	Marshall Space Flight Center, Location 6201-39, 86-004205	Space Station Management Communications Data System	Supports project management.	3,600
Space Station	Marshall Space Flight Center, Location 6206-AH, 86-004535	Sigma V Replacement	Supports Space Station model study and Space Shuttle Main Engine Controller software verification.	350

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS.)
Physics and Astronomy	Goddard Space Flight Center, Location 5103-CA, 86-002130	Cosmic Background Explorer (COBE)	New capacity in support of integration and test of COBE.	1,057
Physics and Astronomy	Marshall Space Flight Center, Location 6201-26, 86-004085	IBM 4341 Central Processing Unit Replacement	Supports project management.	782
Physics and Astronomy	Marshall Space Flight Center, Location 6201-25, 86-004025	High Capacity Mass Storage	Supports Spacelab mission management.	360
Physics and Astronomy	Marshall Space Flight Center, Location 6209-TC, 86-004695	Payload Crew Training Center Development and Operations Processor System Replacement	Supports Spacelab mission management advanced program and crew training for Spacelab experiments.	400
Physics and Astronomy	Marshall Space Flight Center, Location 6201-35, 86-004170	Administrative and Program Support Directorate Node	Support Spacelab mission management.	260

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS.)
Planetary Exploration	Jet Propulsion Laboratory, Location 5507-GL, 86-009655	University of Iowa Computers	Supports Galileo Project	777
Space Applications	Goddard Space Flight Center, Science and Applications Computing Center (SACC), 86-000855, 865; 51-81-01	SACC Upgrade	Continues replacements of computing facility to meet program requirements.	2,255
Space Applications	Goddard Space Flight Center, Bldg. 22, 86-001560, 1635; 51-82-10	High Speed Computing Facility	Support climate research, global scale atmospheric processes, and crustal dynamics.	143
Space Applications	Jet Propulsion Laboratory, Location 5507-OD, 86-004885	Pilot Ocean Data System	New capacity in support of data systems.	500
Space Applications	Jet Propulsion Laboratory, 55-85-01	Data Processing System	Provides global wind field data on Scatterometer Project.	632
Space Applications	Lewis Research Center, Location 2200, 86-000750	Master Control System for Advanced Communi- cations Technology Satellite (ACTS) Hardware	New capacity in support of advanced communications research.	1,500

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS.)
Aeronautical Research and Technology	Ames Research Center, NAS Facility, 86-006905, 6935; 21-84-03	Numerical Aerodynamic Simulation Processing System Network (NPSN)	Provides a large scale, high performance compu- tational resource for solving three dimensional, viscous fluid flow equations specially oriented toward the solution of aerodynamic and fluid dynamic problems.	17,300
Aeronautical Research and Technology	Ames Research Center, Bldg. 233, Central Computer Facility 86-011240; 21-85-01	Large Scale Scientific Processor (LSSP)	Provides large scale, very high speed vector processing capabilities in computational fluid dynamics and computa- tional physics.	6,050
Aeronautical Research and Technology	Ames Research Center, Bldg. 233, Central Computer Facility, 21-85-03	Mass Storage System (MSS)	Provides the main data storage and data manage- ment facilities for the Central Computer Facility computers.	1,500
Aeronautical Research and Technology	Ames Research Center, Bldg. N-211, 21-85-04	B-200 Super King Air Aircraft	Provides inflight monitoring of research aircraft operations and related logistics support for research programs.	1,043
Aeronautical Research and Technology	Langley Research Center, Location 2302-BB, 86-006050	Mass Storage	Adds additional cartridge storage units to meet increased volume.	400

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS.)
Aeronautical Research and Technology	Langley Research Center, Location 2302-BB, 86-006055	Simulation Network	Options for completion of the Real Time Communications Subsystem	314
Aeronautical Research and Technology	Langley Research Center, Location 2302-BB, 86-006070	Vector Processing	Upgrades Vector System to 32 million 64-bit words of high- speed control memory.	3,000
Aeronautical Research and Technology	Langley Research Center, Location 2304-C3, 86-006345	8-Foot High Temperature Structures Tunnel (HTST) Data Systems Upgrade	Upgrades current system to support research demands.	700
Aeronautical Research and Technology	Lewis Research Center, Bldg. 142, 86-000720, 22-84-03	Transient Data Recorder Replacement (TRADAR III)	Upgrades existing recording system; replacement parts no longer available and maintenance costs excessive.	750
Aeronautical Research and Technology	Lewis Research Center, Bldg. 77, 86-000775, 22-85-01	Real-Time Simulation System	Provides real-time simulation of propulsion systems.	1,000
Aeronautical Research and Technology	Lewis Research Center, Bldg. 142, 86-000385	Bulk Output Processor	Manages bulk graphic and print output from network large mainframes.	600
Aeronautical Research and Technology	Lewis Research Center, Bldg. 142, 86-000410	Archival Mass Storage Hardware	Provides large mainframe storage backup.	400



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS.)
Shuttle Production and Capability Development	Johnson Space Center, Location 7201-AA, 86-010425	DOD1181 Lease	Supports Shuttle Orbiter.	460
Shuttle Production and Capability Development	Johnson Space Center, Location 7203-AA, 86-010175	Mission Control Center Host 1 Upgrade and Disk Purchase	Supports launch and mission support.	8,195
Shuttle Production and Capability Development	Johnson Space Center, Bldgs. 35 and 5, 86-010185; 72-76-01	Shuttle Mission Simulator Guidance and Navigation System Replacement	Supports Shuttle Orbiter.	1,048
Shuttle Production and Capability Development	Johnson Space Center, Bldg. 5, 86-010225; 72-84-03	Shuttle Mission Simulator Reliability Performance Modification	Supports Shuttle Orbiter.	200
Shuttle Production and Capability Development	Johnson Space Center, Location 7208-AK, 86-010400	Shuttle Mission Simulator Host Disk A/B/C	Supports Shuttle Orbiter.	389
Shuttle Production and Capability Development	Johnson Space Center, Location 7256-XX, 86-010245	Engineering Systems Laboratory Augmentation	Supports Shuttle Orbiter.	400
Shuttle Production and Capability Development	Johnson Space Center, Location 7274-NN, 86-010280	Flight Design System System Hardware Upgrade and Replacement	Supports Shuttle Orbiter.	800
Shuttle Production and Capability Development	Johnson Space Center, Location 7277-AA, 86-010305	IBM 3083 Upgrade	Supports Shuttle Orbiter.	1,550

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS.)
Shuttle Production and Capability Development	Johnson Space Center, Location 7277-AA, 86-010310	Disk Subsystem	Supports Shuttle Orbiter.	680
Shuttle Production and Capability Development	Johnson Space Center, Location 7277-AA, 86-101320	IBM 3033 Replacement	Supports Shuttle Orbiter.	1,800
Shuttle Production and Capability Development	Johnson Space Center, Bldg. 5, 72-85-09	Simulation Communication Equipment	Replaces obsolete voice communications system on the Shuttle Mission Simulator.	1,000
Shuttle Production and Capability Development	Kennedy Space Center, Launch Complex 39 and Industrial Area, 76-85-01	Operational Intercom System	Provides voice communi- cations for support of checkout and launch of the Space Shuttle.	18,384
Shuttle Production and Capability Development	Kennedy Space Center, Location 7602-J3, 86-005045	Shuttle Inventory Management System (SIMS)II, Amendment I	Supports launch site logistics functions.	305
Shuttle Production and Capability Development	Kennedy Space Center, Location 7602-M1, 86-005050	Central Computer Management System, Central Processing Unit Replacement	Supports launch site equipment.	400

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS. )
Shuttle Production and Capability Development	Marshall Space Flight Center, Michoud Assembly Facility, New Orleans, LA, 62-86-01	Private Automatic Branch Exchange (PABX)	Provides integrated voice/data digital PABX for program support communications.	300
Shuttle Production and Capability Development	Marshall Space Flight Center, Bldg. 4207, 62-86-02	Private Automatic Branch Exchange (PABX)	Provides integrated voice/data digital PABX for program support communications.	2,900
Shuttle Production and Capability Development	Marshall Space Flight Center, Location 6206-XX, 86-004590	CI5000 Analog Equipment Replacement	Supports Space Shuttle Main Engine (SSME).	70
Shuttle Production and Capability Development	Marshall Space Flight Center, Location 6202-01, 86-0004275	Remote Communications processor	Supports external tank.	279
Shuttle Production and Capability Development	Marshall Space Flight Center, Location 6202-01, 86-004285	FR80 Replacement	Supports external tank.	566
Shuttle Production and Capability Development	Marshall Space Flight Center, Location 6206-AI, 86-004540	Sigma I Replacement	Supports Space Shuttle Main Engine Controller software verification and Space Station model study.	350

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS. )
Space Transportation Operations	Johnson Space Center, Location 7201-AA, 86-010430	Xerox 9700 Lease	Supports Shuttle operations	444
Space Transportation Operations	Johnson Space Center, Location 7266-AC, 86-010265	Shuttle Payload Selection System Replacement	Supports Shuttle operations.	500
Space Transportation Operations	Kennedy Space Center, Cape Canaveral Air Force Station, 76-86-01	Aircraft Refueler	Transports 5,000 gallons of hydrocarbon fuel.	350
Space Transportation Operations	Kennedy Space Center, Location 7601-P2, 86-005155	Configuration Management Data System	Supports Shuttle operations in Engineering Development Directorate.	115
Space Transportation Operations	Kennedy Space Center, Location 7602, 86-005115	Various ADPE purchased by Lockheed Space Operations Corp.	Supports Shuttle operations for the Shuttle Processing contract.	4,200
Space Transportation Operations	Kennedy Space Center, Location 7602-D4, 86-005055	Data Management System	Supports Shuttle operations.	500
Space Transportation Operations	Marshall Space Flight Center, Location 6201-25, 86-003980	S-1100 Processor/Memory Expansion	Supports Shuttle and Spacelab operations.	334

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS. )
Space Transportation Operations	Marshall Space Flight Center, Location 6201-25, 86-004005; 62-85-03	S-1100/82 Lease	Supports Shuttle operations.	809
Space Transportation Operations	Marshall Space Flight Center, Location 6205-AB, 86-004500	Data System Technology/ Huntsville Operations Support Center Hardware to Data Base Space Shuttle Main Engine	Supports Shuttle operations.	800
Space Transportation Operations	Marshall Space Flight Center, Location 6202-01, 86-004320; 62-84-05	External Tank High-speed Storage Augmentation.	Supports Shuttle operations.	336
Space Transportation Operations	Marshall Space Flight Center, Location 6202-01, 86-004325	Sperry 1100/83 Backing Storage Augmentation	Supports Shuttle operations.	278

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS.)
Space and Ground Networks, Communication and Data Systems	Goddard Space Flight Center, Bldg. 14, 51-80-02	Project Operations Control Center	Supports mission control workload.	200
Space and Ground Networks, Communication and Data Systems	Goddard Space Flight Center, Bldg. 23, 86-001420, 1425; 51-82-04	Univac 1100/82 Computer and Peripherals	Spacelab output processor.	3,200
Space and Ground Networks, Communication and Data Systems	Goddard Space Flight Center, Bldg. 14 86-002510, 2516; 51-82-06	Command Management System	Provides computing capability for Project Operations Control Centers (POCC's).	1,500
Space and Ground Networks, Communication and Data Systems	Goddard Space Flight Center, Bldg. 14, 86-002545, 2560; 51-82-07	Orbit Computation System	Provides mission operations orbit computing support.	1,800
Space and Ground Networks, Communication and Data Systems	Goddard Space Flight Center, Bldg. 23, 51-82-09	Computer and Special Data Capture Equipment	Provides a capability to account for packetized data from Space Telescope.	200
Space and Ground Networks, Communication and Data Systems	Goddard Space Flight Center, Bldg. 3/14, 86-002290; 51-84-02	Multi-Satellite Operations Control Center (MSOCC-I) Upgrade	Upgrades real-time operations capability for supporting multiple spacecraft in the Control Center.	3,000
Space and Ground Networks, Communication and Data Systems	Goddard Space Flight Center, Bldg. 23, 86-002055, 2060, 2105; 51-84-03	Gamma Ray Observatory (GRO) Data Capture System	Captures science data from the GRO spacecraft.	3,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1986 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1986 OBLIGATIONS (\$ IN THOUS.)
Space and Ground Networks, Communication and Data Systems	Goddard Space Flight Center, Bldg. 3/14, 86-002220, 2240; 51-84-06	Univac 1100/82 Leased System in the Network Control Center	Main Processor System supporting operational Network Control Center for TDRSS.	1,900
Space and Ground Networks, Communication and Data Systems	Ames Research Center, Dryden Flight Research Facility, 21-85-06	Telemetry/Radar Acquisition and Processing System	Supports flight missions at the aeronautical test range.	1,000

**DATE DUE**

1968 1016 1016

1. 2016 1016 1016

1016 1016 1016  
1016 1016 1016

1016 1016 1016

**NASA HEADQUARTERS LIBRARY**

**Washington, DC 20546**